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Environmental Assessment of a Reciprocating Engine Retrofitted with Selective Catalytic Reduction. Volume 2 Data Supplement

Acurex Corp., Mountain View, CA

Prepared for

Environmental Protection Agency
Research Triangle Park, NC

Apr 86

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April 1986

ENVIRONMENTAL ASSESSMENT OF A RECIPROCATING ENGINE RETROFITTED WITH SELECTIVE CATALYTIC REDUCTION

Volume II
Data Supplement

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16. ABSTRACT The report gives results of comprehensive emission measurements and 15-day continuous emission monitoring for a 1,500 kW (2000 hp) gas-fired, four-stroke turbocharged reciprocating engine equipped with an ammonia-based selective catalytic reduction system for NOx control. Emission reductions were held at about 80% using an ammonia/NO ratio of about 1.0. NOx levels at the catalyst inlet ranged from 2,200 to 2,600 ppm at an exhaust gas oxygen level of about 11%. NOx levels at the catalyst outlet ranged from 65 to 120 ppm. The catalyst had relatively minor effect on CO and particulate emissions, but increased total cyanides by 3 orders of magnitude (from 7 micrograms/dscm to 2.4 mg/dscm) across the catalyst. Total organics decreased about 70%, from 4.9 to 1.5 mg/dscm. Analyses showed benzene and toluene as the major organic constituents in the catalyst exhaust. Polycyclic aromatics also decreased across the catalyst. The 15-day continuous monitoring tests showed that the catalyst was generally able to maintain NOx reductions at about 80%. Departures from these levels occurred only during brief load surges and ammonia flowrate spikes.

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ABSTRACT

Comprehensive emission measurements and 15-day continuous emission monitoring was performed for a 1,500 kW (2000 hp) gas-fired, four-stroke turbocharged reciprocating engine equipped with an ammonia-based selective catalytic reduction system for NO_x control. Emission reductions were held at about 80 percent using an ammonia-to-NO ratio of about 1.0. NO_x levels at the catalyst inlet ranged from 2,200 to 2,600 ppm at an exhaust gas oxygen level of about 11 percent. NO_x levels at the catalyst outlet ranged between 65 and 120 ppm. The catalyst had relatively minor effect on CO and particulate emissions, but increased total cyanides by three orders of magnitude (from 7 μg/dscm to 2.4 mg/dscm) across the catalyst. Total organics decreased about 70 percent from 4.9 mg/dscm to 1.5 mg/dscm. Analyses showed benzene and toluene as the major organic constituents in the catalyst exhaust. Polycyclic aromatics also decreased across the catalyst. The 15-day continuous monitoring tests showed that the catalyst was generally able to maintain NO_x reductions at about 80 percent. Departures from these levels occurred only during brief load surges and ammonia flowrate spikes.

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SECTION 1

INTRODUCTION

The purpose of this data supplement is to document data in greater detail than was possible in Volume I (Technical Results) of this report. It is intended to provide sufficient detail for researchers to perform their own analysis of the data obtained. Readers are referred to the technical volume for objectives, description of source emission results, interpretations, and conclusions.

The remaining sections of this data supplement contain the following information:

- Section 2, Engine Operating Data
  - -- Engine load, compressor output, fuel flow, pressures, and temperatures
- Section 3, Sampling Data Sheets
  - -- Preliminary stack measurements; operating data tables for SASS (for solid particulate and organics sampling), and impinger sampling systems for HCN and NH_3 sampling
- Section 4, Analytical Laboratory Results
  - -- Total chromatographable organic (TCO) and gravimetric (GRAV) results, determination of semivolatile organic compounds by gas

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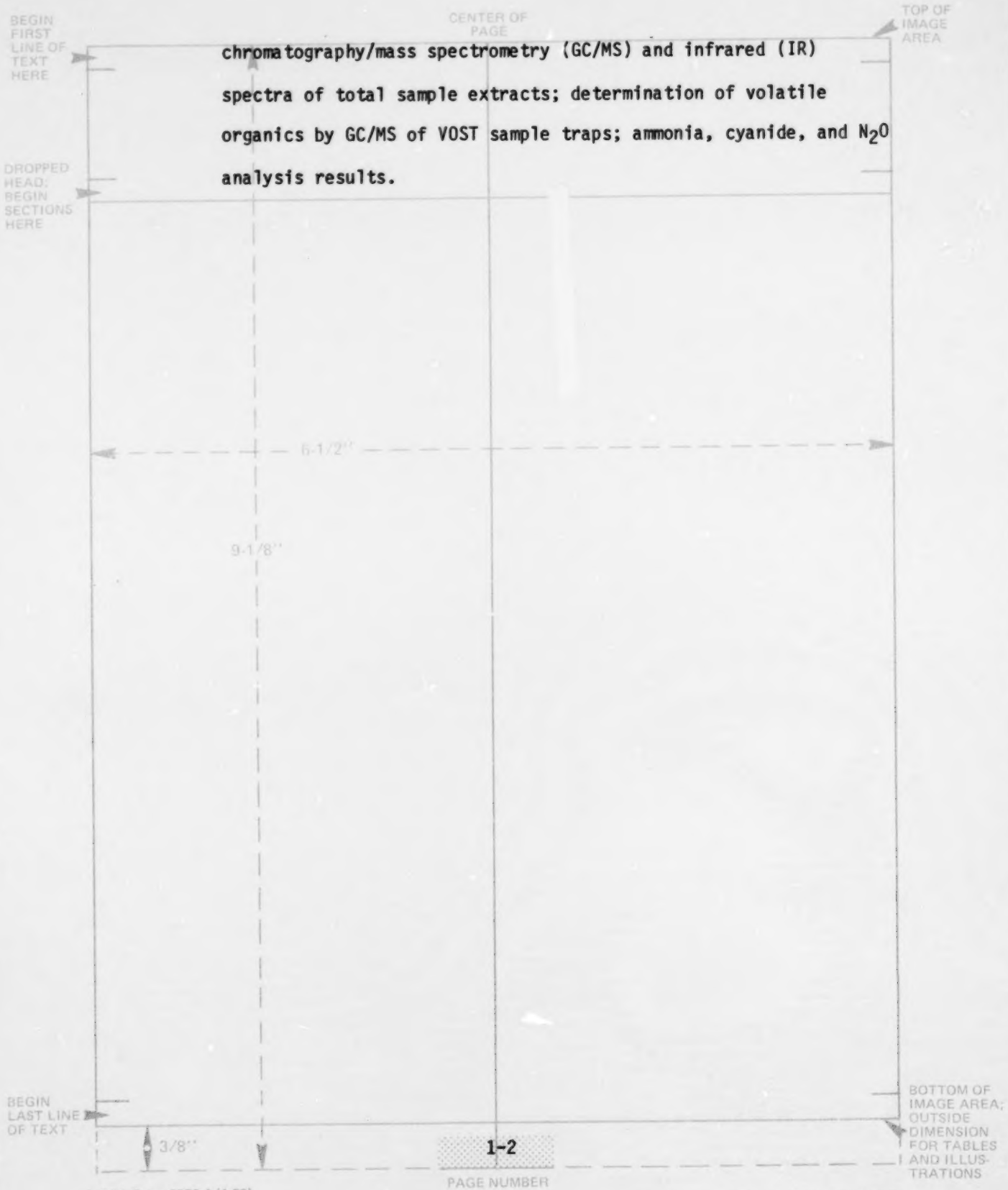
chromatography/mass spectrometry (GC/MS) and infrared (IR) spectra of total sample extracts; determination of volatile organics by GC/MS of VOST sample traps; ammonia, cyanide, and N_2O analysis results.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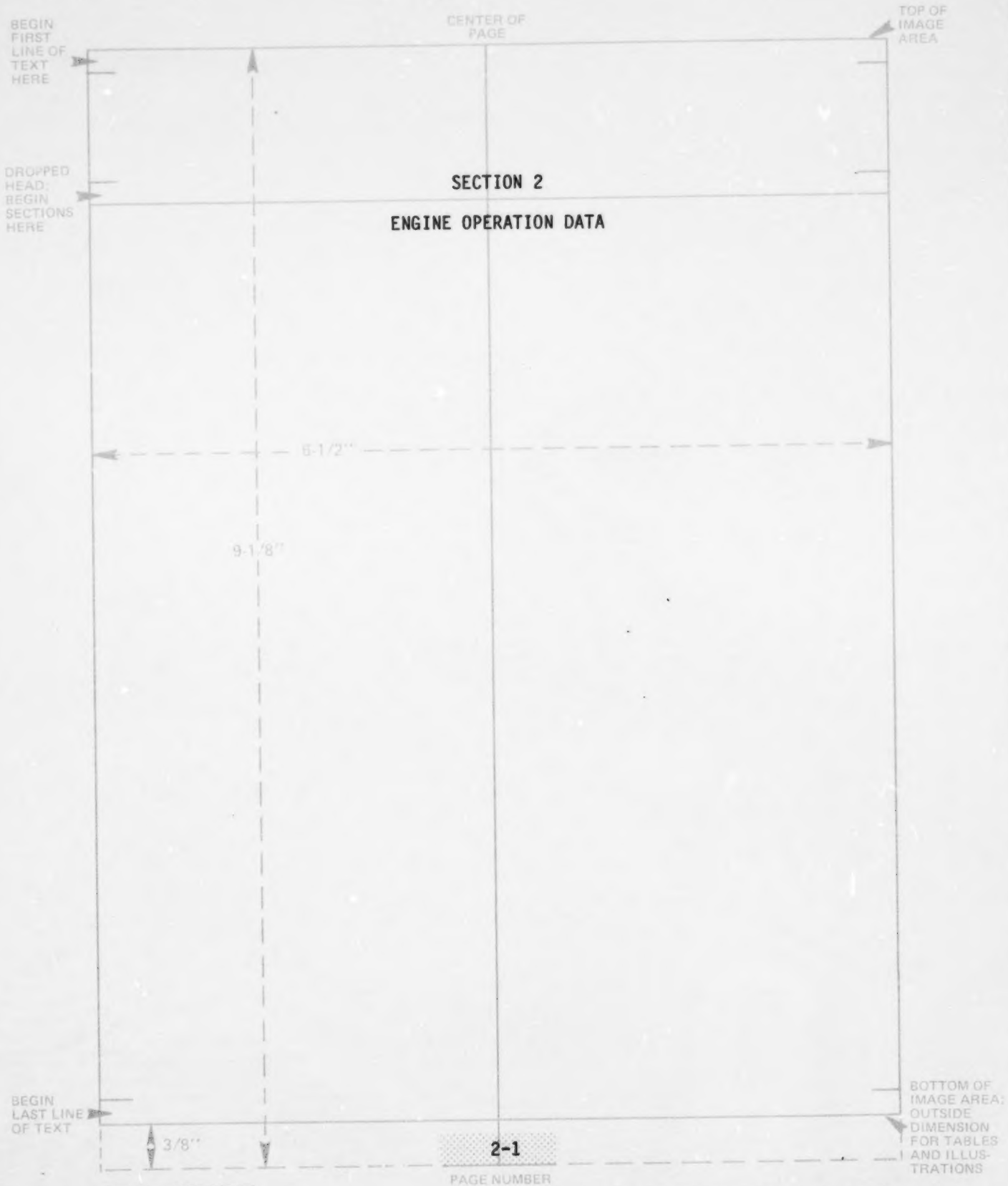

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ENGINE TEST DATA -- COMPREHENSIVE TESTING

Time (August 3, 1984)	8:15	9:00	10:18	11:30	12:55	14:25	15:36
Natural gas meter (ft^3)	12,114,600	12,123,400	12,139,000	12,151,900	12,178,100	12,186,100	12,199,500
Engine rpm	322-331	320-330	325-332	325-330	325-330	320-330	320-333
Fuel header pressure (psig)	25	25	24.5	24.5	24.2	24.2	24
Cooling water pressure (psig)	36	36	36.5	36.5	36.2	36.2	36.5
Lube oil pressure (psig)	57	57	56.5	55.4	56	56	56
Exhaust manifold temperature (°F)	718	719	716	720	716	715	762
Manifold gas pressure (psig)	17	17	16.8	17.0	17.0	17.0	17.2
Air manifold pressure (psig)	4.0	4.0	3.85	3.85	3.85	3.80	3.60
Air manifold temperature (°F)	150	152	153	154	157	158	158
Cylinder exhaust temperature (°F):							
No. 1	680	670	650	610	600	560	600
No. 2	820	825	840	840	840	850	845
No. 3	800	800	810	810	810	820	815
No. 4	720	720	720	720	725	730	730
No. 5	760	770	780	780	780	780	780
No. 6	550	580	620	620	650	660	660
No. 7	710	715	720		730	730	730
No. 8	680	680	680		700	690	700
No. 9	720	720	730		740	740	740
No. 10	705	700	700		730	730	730
No. 11	690	695	700	700	700	700	720
No. 12	750	745	760	760	760	760	762
Turbocharger out temperature, L (°F)	740	730	740	720	730	730	730
Turbocharger out temperature, R (°F)	700	710	720	740	725	740	730
NH_3 flowrate (scfh)	565	575	590		610	620	620
Compressor suction (psig)	587	583	585	585	587	583	583
Compressor intermediate (psig)	1,110	1,130	1,140	1,140	1,140	1,150	1,150
Compressor discharge (psig)	2,850		2,890	2,895	2,900	2,899	2,898
Suction temperature (°F)	80	80	82	82	85	84	
No.1 & 2 discharge (°F)	222/225	225/230	230/235	235/240	235/245	245	
Interstage temperature (°F)	84	82	86	91	91	95	
No. 3 & 4 discharge (°F)	194/190	190/195	195/195	195/200	200/205	200/205	
Catalyst Inlet temperature (°F)	750	740	760				740

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ALISO CANYO.. — STATION 23

MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE 7-26-84

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	1200 330	99	54	25	16	220	38	38	35	587	1090	2535	55
4 PM	331	92	54	24.8	16	3.5	37.4	37	38	574	1080	2591	55
12 MID													

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	160	152	125	135	142	160	80	169	186	96	230	225	—
4 PM	167	166	140	148	158	172	87	200	200	107	245	133	—
12 MID													

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	660	800	760	680	740	440	680	640	700	680	660	720	700	640
4 PM	580	810	780	680	740	540	690	660	700	680	680	730	700	680
12 MID														

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT	
PREVIOUS	
TOTAL GALS	

COMP. CYL. OIL		
PRESENT	DAY	1 Gal
PREVIOUS	EVE.	
TOTAL GALS	MID.	

BIJUR LUBRICATOR	
DAY	
EVE	1/4 T
MID	
TOTAL	

8 AM OIL FILTER ΔP 6 I.S.C. OIL

REMARKS: ON @ 60% Am NOx TESTING LOADED @ 60% Pm

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ALISO CANYO. — STATION 23
MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE JUL 27 1984

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	330	95	54	25	18	4	36	39	36	579	1120	2562	80
4 PM	329	95	54	25	17.5	4	35.5	38	38	520	1150	2591	80
12 MID	330	99	55	25	17.6	4.2	36	38	36	566	1130	2605	58

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INTERSTAGE
8 AM	162	164	135	145	154	172	82	210	190	105	235	230	
4 PM	166	164	140	147	153	171	80	205	208	105	231	238	
12 MID	145	147	136	134	136	156	77	198	185	87	218	214	MISSING

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	680	840	800	700	760	620	700	640	700	700	680	740	720	710
4 PM	660	830	710	700	760	640	680	660	720	710	690	740	720	710
12 MID	620	800	770	680	750	570	670	660	690	670	660	700	690	680

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAY	
PREVIOUS EVE.	
TOTAL GALS MID.	

COMP. CYL. OIL	
~~PRESENT~~ DAY	2 gals
~~PREVIOUS~~ EVE.	
~~TOTAL GALS~~ MID.	1 GAL
TOTAL	3 GALS.

BIJUR LUBRICATOR	
DAY	
EVE	1 qt
MID	
TOTAL	1 qt.

8 AM OIL FILTER ΔP 2 I.S.C. OIL TOTAL 0

REMARKS: 11:40 A ON for NOx test / Loaded @ 12:25 P

E.G.T. @ 2:00 P 740° / 10 PM E.G.T. 730° / 4:00 AM E.G.T. 720°

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ALISO CANYO. — STATION 23

UNIT No. K-6

MAIN COMPRESSOR ENGINE LOG

DATE JUL 28 1984

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	333	98	54	25	18	4.2	36	38	38	586	1140	2500	65
4 PM	329	95	54	25	17.5	3.8	34	38	38	579	1140	2818	55
12 MID	331	96	55	25	17.7	4.0	37	38	38	528	1120	2552	53

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	152	152	128	138	142	160	78	195	193	93	215	215	—
4 PM	160	162	135	144	150	167	81	195	196	100	243	240	—
12 MID	145	147	125	136	136	157	74	193	193	89	219	213	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	550	810	790	690	760	640	680	670	690	690	670	710	690	700
4 PM	600	820	790	690	750	670	690	660	720	710	680	720	720	710
12 MID	580	800	790	680	740	590	670	650	690	680	660	700	690	680

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
~~PRESENT~~ DAY	
~~PREVIOUS~~ EVE	
~~TOTAL GALS~~ MID	

COMP. CYL. OIL	
~~PRESENT~~ DAY	1 GAL
~~PREVIOUS~~ EVE	1 - 3½
~~TOTAL GALS~~ MID	1 GAL

3½ GALS

BIJUR LUBRICATOR	
DAY	1 Qt
EVE	1 Qt
MID	1 qt
TOTAL	3 qt.

8 AM OIL FILTER ΔP 5 I.S.C. OIL

REMARKS: E.G.T. at NOON 725° / E.G.T AT 8 PM 716° / EGT AT 4 AM 716°

= FIN FAN PUT ON LOW

DISC 1 AM LOW COMP. LUBE - ON @ 1 AM ORDED 1 AM / [illegible]

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UNIT No. K-6

MAIN COMPRESSOR ENGINE LOG

DATE JUL 29 19[illegible]

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	330	98	54	25.2	17.5	4.0	36.7	38	39	516	1100	2510	58
4 PM	330	95	54	24.5	16.5	3.7	37	37	37	480	1100	2715	55
12 MID	330	96	54	25	17	3.7	37	38	38	586	1100	2535	49

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	151	151	128	138	140	159	76	194	194	91	223	220	—
4 PM	160	160	136	145	150	167	82	210	213	101	253	245	—
12 MID	148	152	130	140	140	160	80	185	195	92	220	215	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	620	800	780	690	740	430	670	650	700	690	660	710	700	680
4 PM	550	800	750	700	760	460	670	660	700	670	640	720	700	660
12 MID	610	800	760	680	720	440*	670	670	690	670	640	710	700	650

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAY	8 - GAL
PREVIOUS EVE	0
TOTAL GALS MID	8

COMP. CYL. OIL	
PRESENT DAY	1 - GAL
PREVIOUS (VI)	1½ GAL
TOTAL GALS MID	2½

BIJUR LUBRICATOR	
DAY	½ Qt
EVE	½ Qt
MID	0
TOTAL	1

8 AM OIL FILTER ΔP 5 I.S.C. OIL —

REMARKS: EGT at 8:00 AM 730°/ 12:30 P Load & fuel Suc Vo Disch K.V. Loaded [illegible]
Load at 1 PM / EGT [illegible] / * BOTH PLUGS FIRING #5 CYL at 12:30 PM
EGT 4:00 PM = 723°/

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ALISO CANYO.. — STATION 23

MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE JUL 30 1984

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	325	98	54	25	17.5	4.0	365	37	38	535	1100	2585	54
4 PM	331	95	54	24.5	18	3.9	37	38	38	477	1100		60
12 MID													

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	158	157	130	140	147	165	76	190	204	93	229	223	
4 PM	166	164	137	145	154	162	80	215	210	104	240	235	
12 MID													

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	580	800	780	680	730	540	670	650	690	690	650	710	700	670
4 PM	560	720	800	700	760	580	680	660	720	700	680	740	720	700
12 MID														

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
~~PRESENT~~ DAY	0
~~PREVIOUS~~ EVE	0
~~TOTAL GALS~~ MID	

COMP. CYL. OIL	
~~PRESENT~~ DAY	1 GAL
~~PREVIOUS~~ EVE	1 gal
~~TOTAL GALS~~ MID	

BIJUR LUBRICATOR	
DAY	1/2 Qt
EVE	1 1/2 qt
MID	
TOTAL	

8 AM OIL FILTER ΔP 5 I.S.C. OIL

REMARKS: Crashed on Comp Lube Oil Low Pressure 8:30pm / EGT at 8:8pm 730° / ON [illegible]
Loaded 9:15 pm / 4:PM Exhaust temp 710° / 7:45PM/off-Tonybourne)

SO CAL GAS CO 4337-B

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ALISO CANYO.. — STATION 23

UNIT No. K-6

MAIN COMPRESSOR ENGINE LOG

DATE 7-31-84

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM													
4 PM	330	95	54	24.5	17	3.75	36.5	38	35		1110		60
12 MID	330	100	55	25	16	3.75	36	38	36	516	1040	2725	45

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM													—
4 PM	162	160	137	145	150	158	83	190	195	102	240	295	—
12 MID	142	143	122	132	132	138	78	200	195	84	229	239	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM														
4 PM	600	810	810	720	780	640	740	700	740	720	700	760	740	740
12 MID	730	820	780	720	760	540	710	690	720	700	1040	740	740	680

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT	
PREVIOUS Swing	3 Gals
TOTAL GALS	3 gals

COMP. CYL. OIL	
PRESENT	½ GRAV.
PREVIOUS Swing	½ Gal
TOTAL GALS	1

BIJUR LUBRICATOR	
DAY	⅓ Q.t
EVE	
MID	1 qt
TOTAL	1½

8 AM OIL FILTER ΔP _____ I.S.C. OIL _____

REMARKS: ON 9:25 AM / Loaded 10:10 / Exhaust temp Room temp [illegible] /
E.G.T 4 PM 730°

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ALISO CANYO... — STATION 23

MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE 8-1-84

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	334	100+	54	25	17	4.1	36	38	38	586	1100	2850	55
~~4 PM~~ 2 PM	361	99	54	25	16	3.75	365	38	38	564	1050	2685	55
12 MID	330	97	54	25	16.5	3.8	36	38	35	561	1080	2700	50

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	140	144	120	130	131	137	79	195	185	82	223	225	—
4 PM	150	152	122	133	142	145	76	190	185	92	224	230	—
12 MID	156	155	127	137	145	151	78	193	187	91	229	232	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	700	830	810	710	770	550	720	630	720	710	690	740	740	720
4 PM	700	820	800	720	760	450	720	680	720	700	680	760	740	680
12 MID	710	830	790	720	760	480	720	690	720	700	700	750	740	700

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
~~PRESENT Gals~~	
~~PREVIOUS~~ Swings DAYS	3 Gal
TOTAL GALS	3 gals

COMP. CYL. OIL	
PRESENT Gals –	/gal
PREVIOUS Swings DAYS –	
TOTAL GALS	/gal

BIJUR LUBRICATOR	
DAY	
EVE	½ qt
MID	½
TOTAL	2 qt

8 AM OIL FILTER ΔP 6 I.S.C. OIL

REMARKS: EGT at 8:00 720° / Unloaded 8:40 AM / OFF 8:45 AM / ON 8:50 AM / Loaded 8:55 AM / Unloaded and OFF 9:25 AM / ON 12:15 PM / Loaded 12:20 PM / Unloaded and OFF 1:45 PM / ON 9:10 PM / Loaded 9:20 PM / E.G.T. @ [illegible] / E.G.T. @ 12 PM 382° /

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ALISO CANYO.. — STATION 23

MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE 8-2-71

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	331	97	55	25.0	17	.4	36.0	38	35	580	1120	2851	55
4 PM	331	9.1	54	24.5	17	.375	36.5	38	35	538	1160	2886	55
12 MID	332	100	55	25	16	3.5	35.2	38	36	472	1075	2660	39

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	150	150	123	132	140	142	78	192	196	96	225	228	—
4 PM	158	160	135	145	150	156	81	210	205	100	215	220	—
12 MID	150	150	130	139	130	150	78	202	197	93	228	230	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	680	840	820	730	780	520	720	680	730	710	610	760	740	700
4 PM	700	840	800	720	780	510	720	700	740	720	720	760	740	700
12 MID	710	810	790	750	740	610	720	740	730	730	740	770	750	720

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAYS	
PREVIOUS EVE MIDS	
TOTAL GALS	Ø

COMP. CYL. OIL	
PRESENT	1 Gal
PREVIOUS	2 Qts
TOTAL GALS	3 GAL

BIJUR LUBRICATOR	
DAY	
EVE	1½ QT
MID	1 QT
TOTAL	2½ QTS

8 AM OIL FILTER ΔP 6 I.S.C. OIL

REMARKS: EGT @ 8⁰⁰ AM 725° / EGT @ 4⁰⁰ PM 720° EGT @ 12 — 725°

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ALISO CANYO.. — STATION 23

UNIT No. K-6

MAIN COMPRESSOR ENGINE LOG

DATE 2-3-84

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	327	100	55	25.0	16.4	4.2	36.0	38	38	587	1110	2918	52
4 PM	332	93	54	24	17	3.75	36.5	38	35	601	1160	2907	65
12 MID	331	100	54	25	16.6	3.8	36.4	37	34	583	1110	2784	50

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	140	142	120	130	131	137	80	192	188	93	222	225	—
4 PM	160	162	140	150	154	160	[illegible]	[illegible]	200	104	245	250	—
12 MID	144	146	125	135	138	143	78	195	183	86	222	225	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	710	830	800	720	780	560	720	680	720	760	690	750	720	710
4 PM	560	860	820	740	780	660	740	700	740	740	700	750	710	740
12 MID	620	840	800	720	780	540	720	700	730	710	675	760	730	710

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAY	
PREVIOUS	
TOTAL GALS	0

COMP. CYL. OIL	
PRESENT DAY	
PREVIOUS EVE	SAME
TOTAL GALS	19.11

BIJUR LUBRICATOR	
DAY	
EVE	1 QT.
MID	1 QT
TOTAL	2

8 AM OIL FILTER ΔP 5 I.S.C. OIL

REMARKS: EGT @ 7 AM 720° / EGT @ 4 PM [illegible] EGT 12 MID 718/

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ALISO CANYO. — STATION 23

UNIT No. A-6

MAIN COMPRESSOR ENGINE LOG

DATE 6-4-84

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	330±	100	55	25	17	4.2	36.5	39	38	602	1120	2879	60
4 PM	328 ±	95	54	24	17	3.7	36.5	38	35	578	1145	2910	70
12 MID													

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	144	144	120	130	132	140	77	190	185	84	224	230	—
4 PM	164	163	139	148	153	160	85	205	200	102	243	249	—
12 MID													

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	700	830	810	720	790	640	735	690	730	730	700	760	730	730
4 PM	600	850	810	730	790	630	730	700	740	730	710	770	730	730
12 MID														

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL Drums	
PRESENT	
PREVIOUS	
TOTAL GALS	

COMP. CYL. OIL Gals.	
PRESENT	
PREVIOUS	
TOTAL GALS	

BIJUR LUBRICATOR	
DAY	
EVE	
MID	0
TOTAL	0

8 AM OIL FILTER ΔP 5 I.S.C. OIL

REMARKS: 7:27AM EGT 736° – 4 10/pm EGT 737° / down at 7 25/pm Comp Lube oil low press.
11:55pm / off 7:55 – #6 Trashed

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ALISO CANYO... — STATION 23

MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6

DATE AUG 0 0 1984

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM													
4 PM	331	94	54	24.4	18	4.1	36.3	38	38	579	1190	2830	83
12 MID	330	97	54	24.8	17	3.75	36	38	38	523	1080	2810	50

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM													
4 PM	170	169	141	151	157	166	84	210	187	107	235	240	—
12 MID	156	156	130	139	146	153	80	200	197	92	236	240	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM														
4 PM	750	870	840	750	810	690	740	730	740	740	730	790	780	750
12 MID	690	820	780	720	760	440	720	680	720	700	680	750	740	680

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT	
PREVIOUS	
TOTAL GALS	Ø

COMP. CYL. OIL	
PRESENT	
PREVIOUS	½ GAL
TOTAL GALS	1 GAL 1½ GALS.

BIJUR LUBRICATOR	
DAY	
EVE	½ QT
MID	1 QT
TOTAL	1½ QTS.

8 AM OIL FILTER ΔP _____ I.S.C. OIL —

REMARKS: ON 12:20 / [illegible] / E.G.T. at 4:00 PM 765° / EGT @ 12:00 718° /

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ALISO CANYON – STATION 23
MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE Aug 7TH 84

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	330±	98	54	25.6	17	1.0	36	39	38	566	1130	2891	60
4 PM	328	92	53	24	17.2	3.8	36	39	37	579	1170	2940	80
12 MID	330±	100	55	24.5	15	3.5	36.5	42	37	453	1020	2834	40

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	152	151	127	138	140	150	90	195	190	90	227	232	—
4 PM	170	169	143	152	158	166	87	206	203	100	250	255	—
12 MID	138	142	123	132	134	138	75°	213	207	84	238	242	——

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	660	850	805	710	760	560	720	690	730	720	700	740	740	720
4 PM	620	870	830	740	790	620	750	700	750	740	710	790	750	740
12 MID	700	830	790	730	760	480	720	700	710	720	660	700	710	670

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAY EVE	
PREVIOUS MID	20 GALS.
TOTAL GALS	20 GALS.

COMP. CYL. OIL	
PRESENT DAY EVE	1½ GALS
PREVIOUS MID	2 GALS.
TOTAL GALS	3.5 GALS.

BIJUR LUBRICATOR	
DAY	0
EVE	1 Qt.
MID	½ QT.
TOTAL	1½ QTS.

8 AM OIL FILTER ΔP 5 I.S.C. OIL ——

REMARKS: 7AM EGT 735° / 4PM EGT 735° / 11PM E.S.T. 700° FROM SHEET

NO CAL GAS CO 4337 B

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ALISO CANYON – STATION 23
MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE AUGUST 8TH 1934

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	330±	100	55	24.5	17	4	35.0	39	40	563	1110	2896	55
4 PM	330	93	54	24	16.8	3.75	36	38	37	558	1140	2925	80
12 MID	330-	90	54	24.8	18	4.5	35.5	39	39	475	1140	2904	65

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	148	146	125	131	136	144	80	200	195	88	230	235	—
4 PM	170	168	142	153	158	165	88	210	206	100	250	256	—
12 MID	150	148	126	136	138	145	77	210	203	85	227	230	—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	660	840	800	720	780	520	720	680	730	715	700	760	710	700
4 PM	580	860	830	740	790	600	750	700	750	730	710	780	740	730
12 MID	650	840	820	740	790	640	750	700	750	740	720	770	740	730

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAY / EVE	
PREVIOUS MIDN.	
TOTAL GALS	

COMP. CYL. OIL	
PRESENT DAY / EVE	
PREVIOUS MIDN.	
TOTAL GALS	

BIJUR LUBRICATOR	
DAY	
EVE	
MID	
TOTAL	

8 AM OIL FILTER ΔP 6 I.S.C. OIL

REMARKS: EGT @ 12 Noon 715° / EGT @ 4PM 735° / EGT @ 12:00 MID 715°

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ALISO CANYO.. — STATION 23
MAIN COMPRESSOR ENGINE LOG

UNIT No. K-6 DATE AUGUST 9TH 1984

PRESSURES

TIME	RPM	LUBE OIL PUMP	LUBE OIL BRNG.	FUEL HDR.	FUEL MAN.	MAN. AIR	JKT. WTR.	TURB. OIL F.W.	TURB. OIL O.P.	LOW SUCT.	INTER STAGE	HIGH DISCH.	AIR MTR.
8 AM	331	100	54	253	17	4.2	35.5	38	38	586	1170	2927	50
4 PM													
12 MID													

TEMPERATURES

TIME	TURB. WTR. F.W.	TURB. WTR. O.P.	LUBE OIL IN	LUBE OIL OUT	JKT. WTR. IN	JKT. WTR. OUT	LOW SUCT.	No. 4 DISCH.	No. 3 DISCH.	INTER STAGE	No. 2 DISCH.	No. 1 DISCH.	INF. STEP
8 AM	134	138	118	127	138	133	77	190	187	79	217	225	—
4 PM													—
12 MID													—

PYROMETER READINGS

TIME	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8 AM	680	830	800	730	770	510	620	680	720	710	700	760	740	700
4 PM														
12 MID														

OPERATING HOURS	
PREVIOUS	
TODAY	
TOTAL	

CRANKCASE OIL	
PRESENT DAY	
PRESENT EVE	
PREVIOUS mids	
TOTAL GALS	

COMP. CYL. OIL		
PRESENT DAY		3,375
PRESENT EVE		
PREVIOUS mids		
TOTAL GALS		

BIJUR LUBRICATOR	
DAY	1/2
EVE	
MID	
TOTAL	

8 AM OIL FILTER ΔP 6 LBS I.S.C. OIL

REMARKS: USED 9T CAN TO FILL TRABON. FOR 5/an

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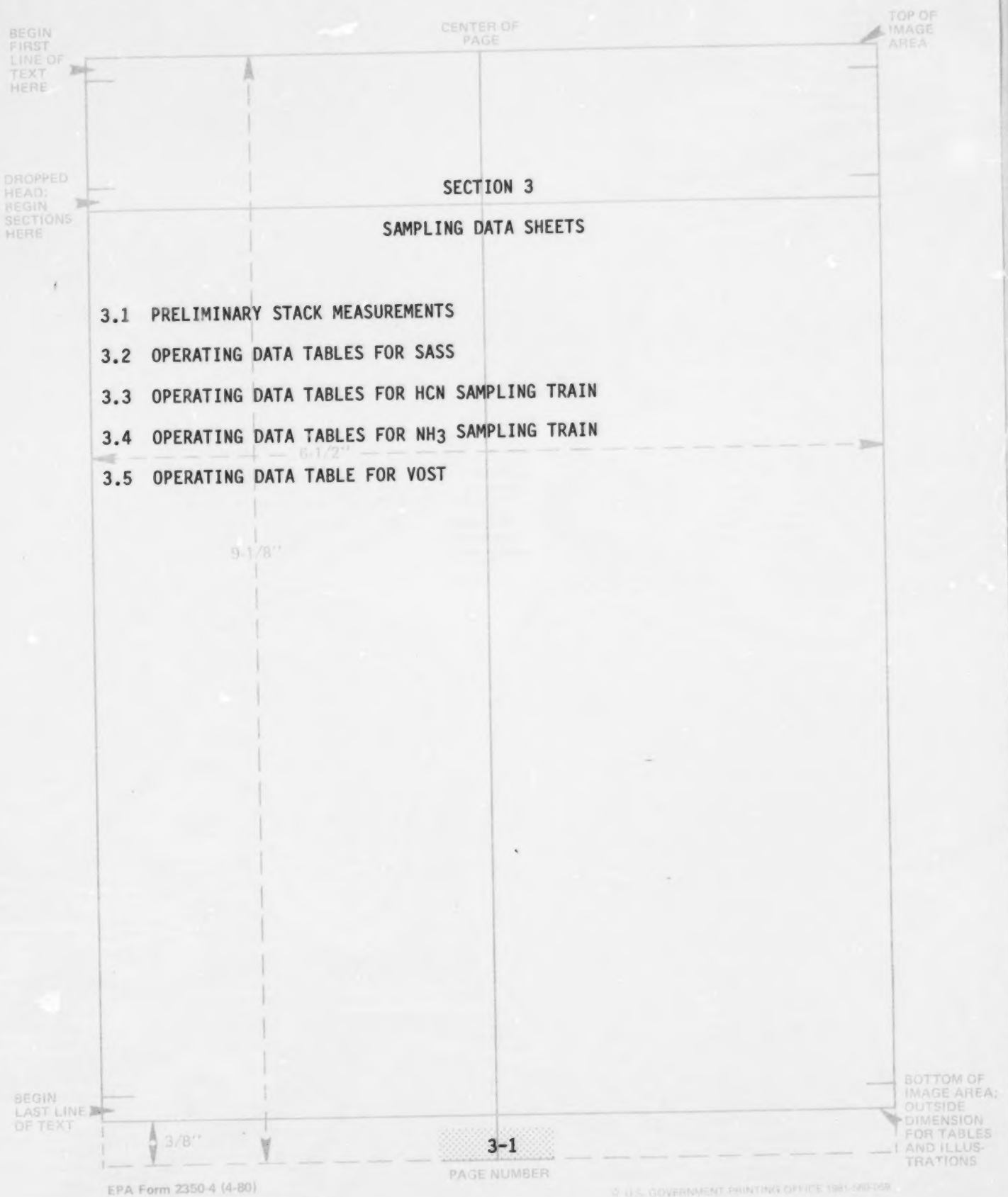

SECTION 3

SAMPLING DATA SHEETS

3.1 PRELIMINARY STACK MEASUREMENTS

3.2 OPERATING DATA TABLES FOR SASS

3.3 OPERATING DATA TABLES FOR HCN SAMPLING TRAIN

3.4 OPERATING DATA TABLES FOR NH_3 SAMPLING TRAIN

3.5 OPERATING DATA TABLE FOR VOST

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PRELIMINARY VELOCITY TRAVERSE

PLANT ALISO CANYON - SCG
DATE AUG 2, 1984
LOCATION UNIT 6 - OUTLET
STACK I.D. 18"
BAROMETRIC PRESSURE, in. Hg 27.84
STACK GAUGE PRESSURE, in. H_2O -.6
OPERATORS Barkus / Kaufmann

DROPPED HEAD; BEGIN SECTIONS HERE

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F		TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.35	588	1.161			
2	1.35	588	1.161			
3	1.25	587	1.118			
4	1.20	586	1.095			
5	1.60	586	1.265			
6	1.65	587	1.284			
7	1.15	587	1.072			
8	.90	586	.948			
9	.70	578	.837			
10	.45	562	.671			
11	.40	560	.632			
12	.40	560	.632			
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
AVERAGE	1.03	563	.9897	AVERAGE		

EPA (Dur) 233
4 72

Form 439 3/84

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA Form 2350-4 (4-80)
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ISOKINETIC SAMPLING WORKSHEET

Plant Alviso SCG Peformed by PWR

Date 8/3/84

Sample Location Outlet

Test No./Type 1 SASS

DROPPED HEAD: BEGIN SECTIONS HERE

$$K = \frac{782.687\ (Cp)^2\ (1-B_{wo})^2\ P_s\ M_d}{K_o^{\,2}\ M_s\ P_m}$$

where: K = Constant of fixed and assumed parameters (dimensionless)

Pitot coefficient (dimensionless)	C_p	0.84
Water vapor in the gas stream (proportion by volume)	B_{wo}	0.12
Absolute stack gas pressure (in. Hg)	static P_s	-.6
Molecular weight, stack gas dry (lb/lb-mole)	M_d	CO_2 5 O_2 11 N_2 84
Orifice coefficient (dimensionless)	K_o	3.356 .039
Molecular weight, stack gas wet (lb/lb-mole) $M_d(1-B_{wo}) + 18(B_{wo})$	M_s	
Abolute meter pressure (in. Hg)	P_m	28.5
$\frac{782.687\ (\quad)^2\ (1-\quad)^2\ (\quad)\ (\quad)}{(\quad)^2\ (\quad)\ (\quad)}$	K	39.747

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BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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ISOKINETIC NOZZLE CALCULATION AND SAMPLING RATE CALCULATION

Plant Alvisо SCG Performed by Kaufmann

Date 8/3/84

Sample Location outlet

Test No./Type 1 SASS

$$N_d = \left(\frac{\Delta H \, T_s}{K \, T_m \, \Delta P} \right)^{.25}$$

where: N_d = Nozzle diameter (inches)

Average pressure differential across the orifice meter (in. H_2O)	ΔH	1.8
Temperature stack gas, average (^oF)	T_s	740
Temperature of gas meter, average (^oF)	T_m	110
Stack gas velocity pressure (in H_2O)	ΔP	1.03
$\left(\frac{(\quad)\ (\quad + 460)}{(\quad)\ (\quad + 460)(\quad)} \right)^{.25}$	N_d	.552

$$\Delta H = K \, (N_d)^4 \, \frac{T_m}{T_s} \, (\Delta P)$$

where: ΔH = Pressure differential across the orifice meter (in H_2O)

Nozzle diameter, actual (inches)	N_d	.495
Temperature of gas meter (^oF)	T_m	
Temperature of stack gas (^oF)	T_s	
Stack gas velocity pressure (in H_2O)	ΔP	
$\left((\quad)\ (\quad)^4 \ \frac{(\quad + 460)}{(\quad + 460)}\ (\quad) \right)$	ΔH	
Magic number _____( )^4	$K(N_d)^4$	2.386

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PRELIMINARY VELOCITY TRAVERSE

PLANT ALISO CANYON SEG -
DATE Aug. 2, 1984
LOCATION UNIT 6 - INLET
STACK I.D. 18"
BAROMETRIC PRESSURE, in. Hg 27.84
STACK GAUGE PRESSURE, in. H_2O
OPERATORS Barkus / Kaufmann

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SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F		TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	1.50	596	1.225			
2	1.50	596	1.225			
3	1.55	597	1.245			
4	1.45	598	1.204			
5	1.45	598	1.204			
6	1.50	600	1.225			
7	1.45	599	1.204			
8	1.40	598	1.183			
9	1.45	597	1.204			
10	1.15	584	1.072			
11	1.10	561	1.049			
12	1.10	561	1.049			
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
AVERAGE	1.383	590.4	1.157	AVERAGE		

EPA (Dur) 233
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Form 439 3/84

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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ISOKINETIC SAMPLING WORKSHEET

Plant AVISO SCG Peformed by PWK

Date 8/3/84

Sample Location Inlet

Test No./Type 1 SASS

$$K = \frac{782.687\ (Cp)^2\ (1-B_{wo})^2\ P_s\ M_d}{K_o^2\ M_s\ P_m}$$

where: K = Constant of fixed and assumed parameters (dimensionless)

Pitot coefficient (dimensionless)	C_p	.84
Water vapor in the gas stream (proportion by volume)	B_{wo}	0.12
Absolute stack gas pressure (in. Hg)	static P_s	+6
Molecular weight, stack gas dry (lb/lb-mole)	M_d	CO_2 - 5 O_2 - 11 N_2 84
Orifice coefficient (dimensionless)	K_o α	3.537 1.016
Molecular weight, stack gas wet (lb/lb-mole) $M_d(1-B_{wo}) + 18(B_{wo})$	M_s	
Abolute meter pressure (in. Hg)	P_m	28.5
$\frac{782.687\ (\_\_\_)^2\ (1-\_\_\_)^2\ (\_\_\_)\ (\_\_\_)}{(\_\_\_)^2\ (\_\_\_)\ (\_\_\_)}$	K	39.393

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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ISOKINETIC NOZZLE CALCULATION AND SAMPLING RATE CALCULATION

Plant Alviso SCG Performed by PWK

Date 8/3/84

Sample Location Inlet

Test No./Type 1 SASS

$$N_d = \left(\frac{\Delta H \, T_s}{K \, T_m \, \Delta P} \right)^{.25}$$

where: N_d = Nozzle diameter (inches)

Average pressure differential across the orifice meter (in. H_2O)	ΔH	1.8
Temperature stack gas, average (^oF)	T_s	750
Temperature of gas meter, average (^oF)	T_m	110
Stack gas velocity pressure (in H_2O)	ΔP	1.38
$\left(\frac{(\quad)\ (\quad + 460)}{(\quad)\ (\quad + 460)(\quad)} \right)^{.25}$	N_d	.525

$$\Delta H = K \, (N_d)^4 \, \frac{T_m}{T_s} \, (\Delta P)$$

where: ΔH = Pressure differential across the orifice meter (in H_2O)

Nozzle diameter, actual (inches)	N_d	.496 P12
Temperature of gas meter (^oF)	T_m	
Temperature of stack gas (^oF)	T_s	
Stack gas velocity pressure (in H_2O)	ΔP	
$\left((\quad)\ (\quad)^4 \left(\frac{\quad + 460)}{\quad + 460)} \right) (\quad) \right)$	ΔH	
Magic number _____( )^4	$K(N_d)^4$	2.203

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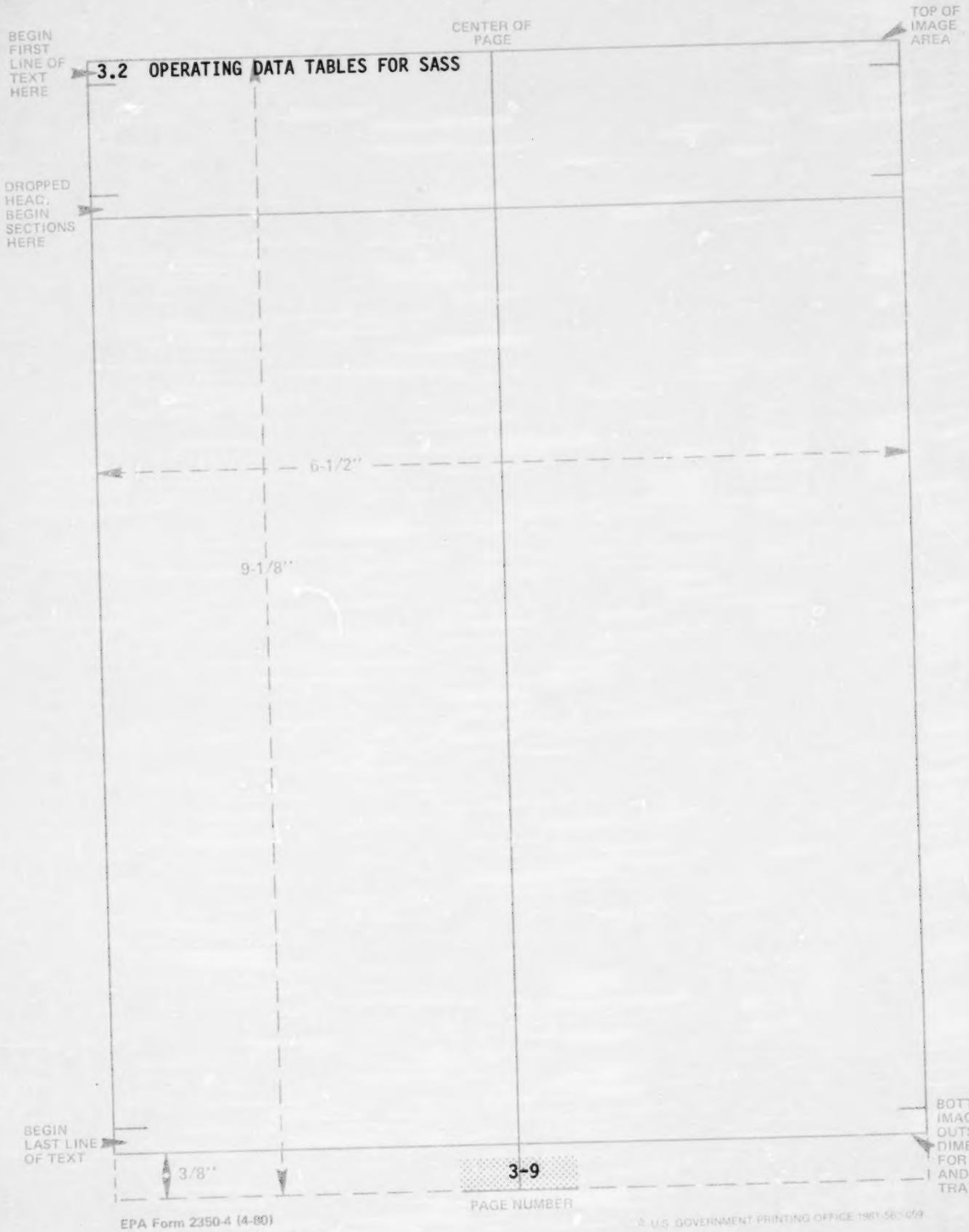
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TYPING GUIDE SHEET

FIELD DATA

Plant Alviso GCS
Date 8/3/84
Sample Location Inlet
Sample Type SASS
Run Number 1
Operator PWR
Ambient Temperature ~97
Barometric Pressure
Static Pressure, (H_2O)
Filter Number(s) 61

Leak Check: Initial at 18 " Hg, .015 CFM
Final at 20 " Hg, .02 CFM
Pitot Leak Check: ✓

Impinger Volumes

	Initial	Final	Net Gain
	500	1300	800.0
	500	530	-470.0
	500		
Silica Gel	1087.0	1250.0	163.0
	~~1087~~		91.0
	1028.6	1119.6	~~1745~~ 1850
SASS Condensate			
Total Volume			~~2832.0~~ 2434.0

Probe Length and Type 3' SS
Nozzle Size & I.D. 0.496 P-12
Pitot Coefficient & I.D. .84
Assumed Moisture 12%
Molecular Weight, Dry, (M_d)
Meter Box Number 81
Meter Coefficient ~~1.016~~ 3.537
α Factor 1.016
K = 39.393
$K(N_d)^4$ = ___ x ( )^4 = 2.203
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Sampling Time, min / Clock Time (24-hr) Clock	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	0 / 0906	Init. 846.853												
	10	79.61	1.1	1.18		726	658	80	66	335	86	84	9	
	20	910.10	1.2	1.25		~~750~~	682	80	61	324	89	86	10	
	30	—	1.2	1.30		732	683	81	61	331	94	90	12	
	40	974.81	1.2	1.30		727	680	82	61	339	97	94	12	
	50	1009.25	1.3	1.43		726	680	82	60	339	98	94	12	
	60	—	1.3	1.43		728	681	83	62	341	99	96	13	
	70	76.05	1.4	1.54		729	676	82	61	334	98	96	14	
	80	102.85	1.4	1.54		730	682	83	60	334	101	96	14	
	90	136.75	1.4	1.54		731	682	85	61	335	100	97	14	

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EPA Form 2250-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 247)
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3-10
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Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		136.75												
	100	171.43	1.4	1.54		731	682	86	61	336	100	98	14	
	110 1056	206.15	1.4	1.54		730	683	84	60	337	101	99	14	
	120	242.05	1.4	1.54		731	683	92	57	334	102	99	14	
	130	276.55	1.4	1.55		729	689	89	56	336	103	98	15	
	140	309.60	1.4	1.55		731	682	93	56	336	104	100	15	
	150	341.52	1.4	1.55		730	683	92	56	340	107	102	15	
	160	—	1.4	1.55		730	682	85	57	339	106	102	18	
	170	413.80	1.4	1.55		733	685	88	59	341	108	103	18	
off	180 1206	450.058	1.4	1.55		732	685	84	60	340	106	104	17	
	180 1220	450.158	—	—		—	—	—	—	—	—	—	—	
	190	485.20	1.4	1.54		733	685	88	64	342	101	99	14	
	200	—	1.4	1.55		733	683	92	58	327	104	102	15	
	210	555.27	1.4	1.55		734	684	90	58	331	108	103	14	
	220	590.33	1.4	1.56		733	685	89	58	334	109	105	14	
	230	625.82	1.4	1.56		730	684	90	57	332	111	107	14	
	240	661.00	1.4	1.56		735	686	89	56	335	110	108	14	
	250	696.30	1.4	1.56		731	682	91	57	332	110	107	14	

Run No. 1 SASS Date 8/3/84 Sample Location Inlet

Comments:

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OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F							Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out		
	696.30													
	260 —	—	1.4	1.57		733	684	89	59	334	112	110	15	
	270 1350	768.70	1.4	1.60		734	685	91	60	336	115	112	16	
	280 —	—	1.4	1.57		733	655	92	59	336	114	112	16	
	290	842.0	1.4	1.57		734	666	90	58	337	115	113	16	
Stop	300 1420	1878.035	1.4	1.58		733	686	91	59	336	115	113	16	
	~~310~~		~~1.4~~	~~1.58~~		~~735~~	~~686~~	~~91~~	~~60~~	~~334~~	~~115~~	~~113~~		

1057.182 1.57

Run No. 1 SAES Date 8/3/84 Sample Location Inlet 102 (848)

Comments:

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EPA Form 2350-4 (4-80) (PREVIOUSLY CIN. EPA FORM 287)
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TYPING GUIDE SHEET

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ISOKINETIC PERFORMANCE WORKSHEET & PARTICULATE CALCULATIONS

Plant SCG - Aliso Canyon Performed by _____

Date 8-3-84

Sample Location SASS INLET

Test No./Type SASS 1

Barometric Pressure (in. Hg)	P_b	28.5
Meter volume (std), $17.64 \left(\frac{V_m}{\alpha}\right)\left(P_b + \frac{\Delta H}{13.6}\right)\left(\frac{}{T_m + 460}\right)$ $17.64 \left(\frac{(1029.3)}{(1.016)}\right)\left((28.3) + \frac{(1.45)}{13.6}\right)\left(\frac{}{(103) + 460}\right)$	$V_{m\ std}$	901.6
Volume of liquid collected (grams)	Vl_c	2434
Volume of liquid at standard condition (scf) $Vl_c \times 0.04707$	$V_{w\ std}$	114.6
Stack gas proportion of water vapor $\frac{V_{w\ std}}{V_{w\ std} + V_{m\ std}}$, $\frac{(114.6)}{(114.6) + (901.6)}$	B_{wo}	0.113
Molecular weight, stack gas dry (lb/lb-mole) (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28) (5.5 x 0.44) + (11.2 x 0.32) + (83.3 + 0.0245 x 0.28)	M_d	29.33
Molecular weight, stack gas wet (lb/lb-mole) $Md(1-B_{wo}) + 18(B_{wo})$, (29.33)(1-0.113) + 18(0.113)	M_s	28.05
Absolute stack pressure (in. Hg) $P_b + \frac{P_{stack}\ (\text{in. } H_2O)}{13.6}$, (28.5) + $\frac{(6)}{13.6}$	P_s	28.94 ~~NA~~ (E)

Form 440 3/84

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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Temperature stack gas, average (°F)	T_s	731
Stack velocity (fps) $85.49\ (C_p)\ (\sqrt{\Delta P_{s\ avg}})\ \sqrt{\frac{T_{s\ avg} + 460}{P_s\ M_s}}$ $85.49\ (0.84)(\sqrt{1.36})^{1.17}\ \sqrt{\frac{(731) + 460}{(26.97)(28.95)}}$	$V_{s(avg)}$	102
Total sample time (minutes)	θ	300
Nozzle diameter, actual (inches)	N_d	0.496
Percent isokinetic (%) $\frac{17.33\ (T_s + 460)(V_{w\ std} + V_{m\ std})}{\theta\ V_s\ P_s\ N_d^2}$ $\frac{17.33\ (731 + 460)((114.6) + (30.6))}{(300)(102.)(28.94)(0.25)}$	%I	94.7
Area of stack (ft^2) $\pi = 3.1416$ $\pi r^2 \div 144$, $\pi(\_\_\_\_)^2 \div 144$	A_s	1.78
Stack gas volume at standard conditions (dscfm) $60\ (1 - B_{wo})Vs_{avg}\ A_s \left(\frac{528}{T_{s\ avg} + 460}\right) \left(\frac{Ps}{29.92}\right)$ $60\ (1 - 0.113)(102)(1.71)\left(\frac{528}{731 + 460}\right) \left(\frac{(28.94)}{(29.92)}\right)$	Q_s	4120
Particulate matter concentration, dry (gr/dscf) $15.432\ \frac{M_p(grams)}{Vm_{std}}$, $15.432\ \frac{(\_\_\_\_)}{(\_\_\_\_)}$	$C_{s(std)}$	
Emission rate of particulate matter (lb/hr) $0.00857\ (Q_s)\ C_{s(std)}$, $0.00857\ (\_\_\_\_)(\_\_\_\_)$	E_p	

Form 4408 3/84

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FIELD DATA

Plant Alviso SASS
Date 3/8/84
Sample Location Outlet
Sample Type SASS
Run Number
Operator FWK
Ambient Temperature ~100
Barometric Pressure
Static Pressure, (H_2O) -0.6
Filter Number(s) 62

Leak Check: Initial at 18 " Hg. .05 CFM
Final at 13 " Hg. .023 CFM
Pitot Leak Check: ✓

Impinger Volumes

Initial	Final	Net Gain
500	680	180.0
500	475	-25.0
500	535	35.0
Silica Gel		
1080.0	1220.5	140.5
1032.9	1134.3	101.4
SASS Condensate		~~2925~~ 2060
Total Volume		~~21564~~ 2491.9

Probe Length and Type 3' SS
Nozzle Size & I.D. .495 P-10
Pitot Coefficient & I.D. 0.84
Assumed Moisture 12%
Molecular Weight, Dry, (M_d)
Meter Box Number 105
Meter Coefficient 3.356
α Factor 1.039
K = 39.747
$K(N_d)^4$ = ___ x ( )^4 = 2.386
$\Delta H = K(N_d)^4 \left(\frac{T_m}{T_s}\right)(P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F							Pump Vacuum in. Hg	$\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out		
	0908 / 0	Init. 184.410												
①	10	213.51	1.4	~~1.54~~ 1.54		614	557	78	72	368	86	86	9	
	20	243.38	1.4	1.57		~~650~~ 653	653	~~69~~ 78	69	370	~~89~~ 88	88	10	
	30	—	1.4	1.60		662	657	76	66	370	103	91	10	
	40	304.78	1.4	1.60		702	643	78	68	374	104	93	10	
	50	335.12	1.4	1.55		720	643	78	70	374	104	94	10	
	60	—	1.5	1.77		652	647	78	71	373	105	95	10	
	70	404.65	1.4	1.65		~~650~~ 642	642	67	63	352	106	96	11	
	80	429.27	1.4	1.65		655	641	67	62	350	106	97	11	
		460.60	1.4	1.65		653	641	66	66	363	106	97	11	

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TOP OF IMAGE AREA

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O		Temperature °F							Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
				Desired	Actual	Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out		
		460.60												
	100	491.15	1.4	1.65		654	640	67	63	380	107	97	11	
	110	522.35	1.4	1.66		654	641	71	66	376	108	98	11	
	120	554.82	1.4	1.66		653	641	64	62	378	107	98	12	
	130	585.30	1.4	1.61		683	646	59	68	372	107	98	11	
	140 (66 35)	~~609.60~~	1.4	1.62		682	650	58	67	370	109	98	11	
	150	647.31	1.4	1.62		684	649	57	64	370	108	99	12	
	160	679.31	1.4	1.62		684	648	58	66	375	108	99	12	
	170	~~709~~.65	1.4	1.62		698	649	62	61	371	109	100	12	
stop	180 1206	742.348	1.4	1.62		697	644	62	68	373	109	100	12	
~~stop~~	180 1222	742.348	—	—		—	—	—	—	—	—	—	—	
	190	773.0	1.4	1.58		694	534	83	65	371	95	97	11	
	200	—	1.4	1.59		695	631	71	62	366	104	97	11	
	210	833.75	1.4	1.61		699	636	65	65	360	116	103	11	
	220	866.21	1.4	1.60		697	636	59	64	362	110	100	11	
	230	~~899~~.00	1.4	1.60		685	633	52	60	385	109	102	11	
	240	928.25	1.4	1.60		694	638	50	60	377	111	103	11	
	250	960.00	1.4	1.60		690	634	53	62	387	111	103	11	

Run No. 1 SASS Date 8/3/84 Sample Location Outlet

Comments:

Form 434 3/84

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3-16
PAGE NUMBER
EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 2871)
TYPING GUIDE SHEET
BOTTOM OF IMAGE AREA
OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
DROPPED HEAD: BEGIN SECTIONS HERE
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TOP OF IMAGE AREA

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F: Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	Avg. $\sqrt{\Delta P}$
		960.00												
	260	—	1.4	1.63		686	634	56	60	387	112	105	11	
	270	1023.15	1.4	1.63		691	634	58	61	385	113	107	12	
	280	—	1.4	1.63		689	632	56	61	371	113	107	11	
	290	86.85	1.4	1.63		689	634	50	60	384	113	108	11	
	300	118.10	1.4	1.63		690	633	50	60	385	114	108	11	
	310 1442	149.80	1.4	1.63		689	625	51	60	384	111	108	11	
	320	1181.367	1.4	1.63		691	621	54	62	389	112	108	11	
Stop														

Run No. 1 SASS

986.857

Date 8/3/84

1.62

Sample Location Outlet 103

(184)

Comments:

Form 434 3/84

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3-17
EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 287)
TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE

ISOKINETIC PERFORMANCE WORKSHEET & PARTICULATE CALCULATIONS

Plant SCG - ALISO CANYON Performed by _____

Date 8-3-84

Sample Location CATALYST OUTLET

Test No./Type SASS 1

Barometric Pressure (in. Hg)	P_b	28.5
Meter volume (std), $17.64 \left(\frac{V_m}{\alpha}\right)\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right)$ $17.64 \left(\frac{(996.9)}{(1.039)}\right)\left(\frac{(28.5) + \frac{(1.62)}{13.6}}{(105) + 460}\right)$	$V_{m\ std}$	857
Volume of liquid collected (grams)	Vl_c	2482
Volume of liquid at standard condition (scf) $Vl_c \times 0.04707$	$V_{w\ std}$	117
Stack gas proportion of water vapor $\frac{V_{w\ std}}{V_{w\ std} + V_{m\ std}}$, $\frac{(117)}{(117) + (857)}$	B_{wo}	12.0%
Molecular weight, stack gas dry (lb/lb-mole) (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28) (5.5 x 0.44) + (11.2 x 0.32) + (83.3 + 0.013 x 0.28)	M_d	29.3
Molecular weight, stack gas wet (lb/lb-mole) $Md(1-B_{wo}) + 18(B_{wo})$, (29.3)(1-0.12) + 18(0.12)	M_s	27.94
Absolute stack pressure (in. Hg) $P_b + \frac{P_{stack}\ (in.\ H_2O)}{13.6}$, (28.5) + $\frac{(-)}{13.6}$	P_s	28.5

Form 440 3/84

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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(PREVIOUSLY CIN. EPA FORM 267)
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TYPING GUIDE SHEET

Temperature stack gas, average (°F)	T_s	683
Stack velocity (fps) $85.49\ (C_p)\ (\sqrt{\Delta P_{s\ avg}})\ \sqrt{\frac{T_{s\,avg} + 460}{P_s\ M_s}}$ $85.49\ (0.84)(\sqrt{1.4})\ \sqrt{\frac{(683) + 460}{(28.5)(27.9)}}$	$V_{s(avg)}$	102
Total sample time (minutes)	θ	320
Nozzle diameter, actual (inches)	N_d	0.485
Percent isokinetic (%) $\frac{17.33\ (T_s + 460)(V_{w\ std} + V_{m\ std})}{\theta\ V_s\ P_s\ N_d^2}$ $\frac{17.33\ (683 + 460)((\ 17) + (857))}{(320)(102)(28.5)(0.25)}$	%I	83
Area of stack (ft^2) $\pi = 3.1416$ $\pi r^2 \div 144$, $\pi(\quad)^2 \div 144$	A_s	1.77
Stack gas volume at standard conditions (dscfm) $60\ (1 - B_{wo})V_{s\,avg}\ A_s \left(\frac{528}{T_{s\ avg} + 460}\right)\left(\frac{Ps}{29.92}\right)$ $60\ (1 - 0.12)(102)(1.77)\left(\frac{528}{683 + 460}\right)\left(\frac{(28.5)}{(29.92)}\right)$	Q_s	4195
Particulate matter concentration, dry (gr/dscf) $15.432\ \frac{M_p(grams)}{Vm_{std}}$, $15.432\ \frac{(\quad)}{(\quad)}$	$C_{s(std)}$	
Emission rate of particulate matter (lb/hr) $0.00857\ (Q_s)\ C_{s(std)}$, $0.00857\ (\quad)(\quad)$	E_p	

Form 4402 3/84

EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 287)
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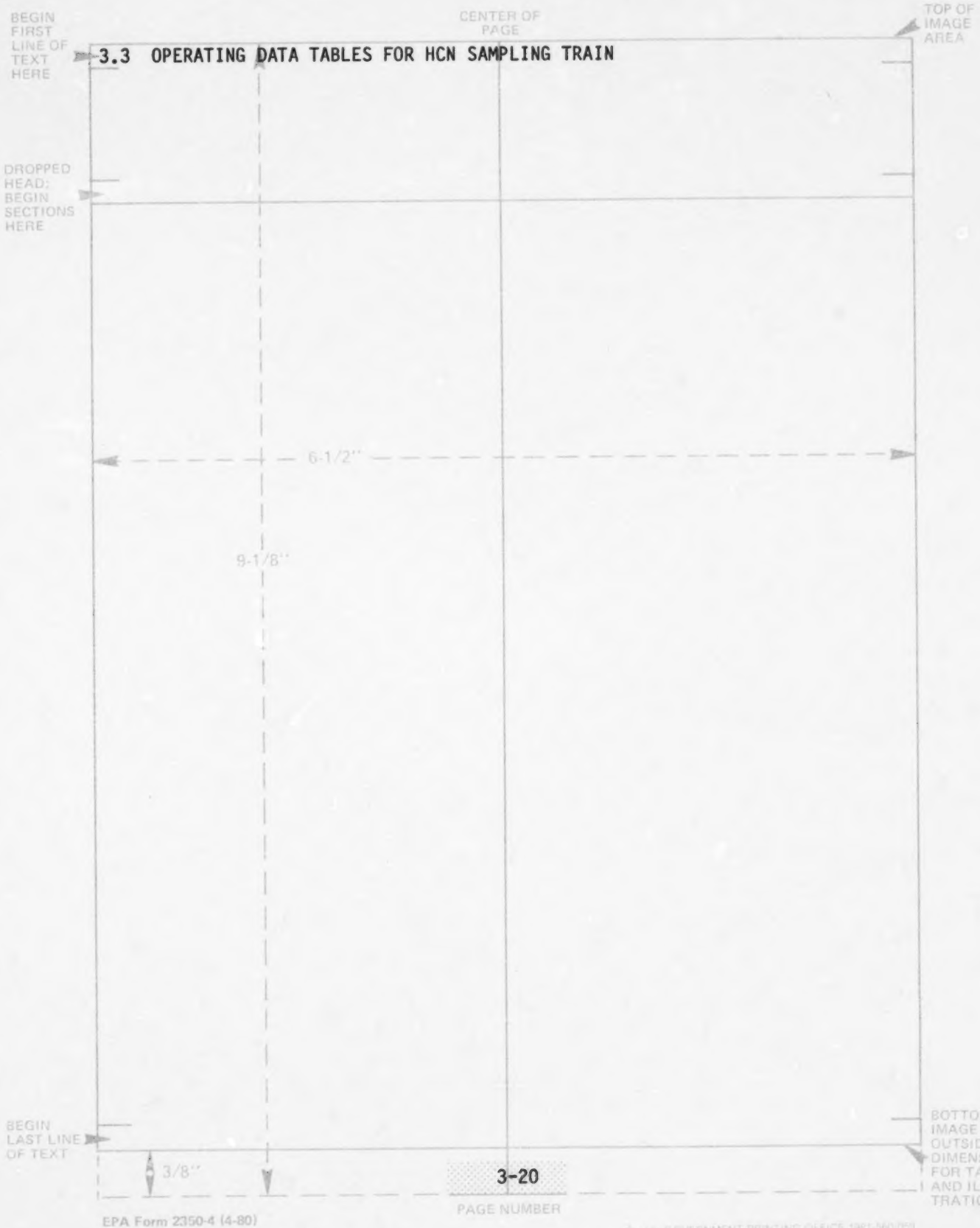

EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 287)

☆ U.S. GOVERNMENT PRINTING OFFICE 1981-360-003

TYPING GUIDE SHEET

FIELD DATA

Plant SCG ALISO CANYON
Date AUG 3, 1984
Sample Location UNIT 6 - IN
Sample Type CN
Run Number 1-INLET ONLY
Operator BARKUS
Ambient Temperature 85
Barometric Pressure 28.5
Static Pressure, (H_2O)
Filter Number(s)

Leak Check: Initial at 11 " Hg, .003 CFM
Final at 11 " Hg, .003 CFM
Pitot Leak Check:

Impinger Volumes

	Initial	Final	Net Gain
	100	123	
	100	107	
	0	2	
Silica Gel	608.4	613.1	
SASS Condensate			
Total Volume			

Probe Length and Type
Nozzle Size & I.D.
Pitot Coefficient & I.D.
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number D556
Meter Coefficient
α Factor
K =
$K(M_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(M_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1635 / 0	Init. 523.628												
7	5	526.100		.75	.75						95	96	8	
	10	528.690		.75	.75						94	95	8	
	15	531.090		.75	.75						93	94	8	
	20	533.590		.75	.75						94	94	8	
	25	536.182		.75	.75						94	94	8	
	30	538.693		.75	.75						94	94	8	
	1705													
		15.065			.25						94			

Comments:

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EPA Form 2350-4 (4-80)
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PAGE NUMBER
3-21
TYPING GUIDE SHEET
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FIELD DATA

Plant SCE ALISO CANYON
Date Aug 3 1984
Sample Location INLET UNIT 6
Sample Type CN
Run Number 2 CN INLET
Operator BARKUS
Ambient Temperature 83
Barometric Pressure 28.50
Static Pressure, (H_2O)
Filter Number(s)

Leak Check: Initial at 12 " Hg, .001 CFM
Final at 13 " Hg, .015 CFM
Pitot Leak Check:

Impinger Volumes	Initial	Final	Net Gain
	100	116	
	100	113	
	0	2	
Silica Gel	637.4	644.5	
SASS Condensate			
Total Volume			

Probe Length and Type
Nozzle Size & I.D.
Pitot Coefficient & I.D.
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number 0556
Meter Coefficient
α Factor
K =
$K(M_d)^4 = \_\_\_ \times (\quad)^4 = \_\_\_$
$\Delta H = K(M_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1822 / 0	Init. 539.015												
7	5	541.465		.75	.75						91	93	9	
	10	544.097		.75	.75						90	91	9	
	15	546.444		.75	.75						90	91	9	
	20	548.930		.75	.75						89	90	9	
	25	551.433		.75	.75						89	90	9	
	30 / 1852	553.898		.75	.75						89	90	9	
		14.863										90		

Comments:

Form 481 3/84

EPA Form 2350-4 (4-80) (PREVIOUSLY CIN: EPA FORM 287)
PAGE NUMBER 3-22
TYPING GUIDE SHEET
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FIELD DATA

Plant SCG ALISO CANYON
Date AUG 3, 1984
Sample Location OUTLET-6
Sample Type CN
Run Number 2-OUTLET
Operator BARRY'S
Ambient Temperature 83
Barometric Pressure 28.50
Static Pressure, (H_2O)
Filter Number(s)

Leak Check: Initial at 12" Hg, .025 CFM
Final at 11" Hg, .037 CFM
Pitot Leak Check:

Impinger Volumes	Initial	Final	Net Gain
	100	128	
	100	104	
	0	2	
Silica Gel	647.0	654.0	
SASS Condensate			
Total Volume			

Probe Length and Type
Nozzle Size & I.D.
Pitot Coefficient & I.D.
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number 0554
Meter Coefficient
α Factor
K =
$K(M_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(M_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1320 / 0	Init. 401.140												
7	5	403.600		.75	.75						101	99	10	
	10	405.971		.75	.75						101	99	9	
	15	408.490		.75	.75						101	99	9	
	20	411.000		.75	.75						101	98	10	
	25	413.521		.75	.75						101	99	10	
	30	416.053		.75	.75						101	98	10	
	1850													
		14.913									100			

Comments:

2-OUTLET 901597

Form 461 3/84

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EPA Form 2350-4 (4-80) (PREVIOUSLY CIN. EPA FORM 287)
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FIELD DATA

Plant SCG ALISO CANYON
Date AUG 3, 1984
Sample Location OUTLET-6
Sample Type CN
Run Number 1-OUTLET
Operator BARNES
Ambient Temperature 85
Barometric Pressure 28.50
Static Pressure, (H_2O)
Filter Number(s)

Leak Check: Initial at 11 " Hg, .016 CFM
Final at ___ " Hg, ___ CFM
Pitot Leak Check:

Impinger Volumes	Initial	Final	Net Gain
	100	114	
	100	107	
	[illegible]0	3	
Silica Gel	1638.7	1647.6	
SASS Condensate			
Total Volume			

Probe Length and Type
Nozzle Size & I.D.
Pitot Coefficient & I.D.
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number 0 55[illegible]
Meter Coefficient
α Factor
K =
$K(M_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(M_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1633 / 0	Init. 382,594												
7	5	385.075		.75	.75						93	91	10	
	10	387.550		.75	.75						93	91	10	
	15	390.085		.75	.75						95	92	10	
	20	392.591		.75	.75						96	94	11	
	25	395.096		.75	.75						97	95	11	
	30	397.613		.75	.75						98	96	11	
	1703													
		15.019			.75						94			

Comments:
Blank 1-2 CN- 901634
Sample No. 901598

Form 461 3/84

EPA Form 2350-4 (4-80) (PREVIOUSLY CIN. EPA FORM 287)
PAGE NUMBER 3-24
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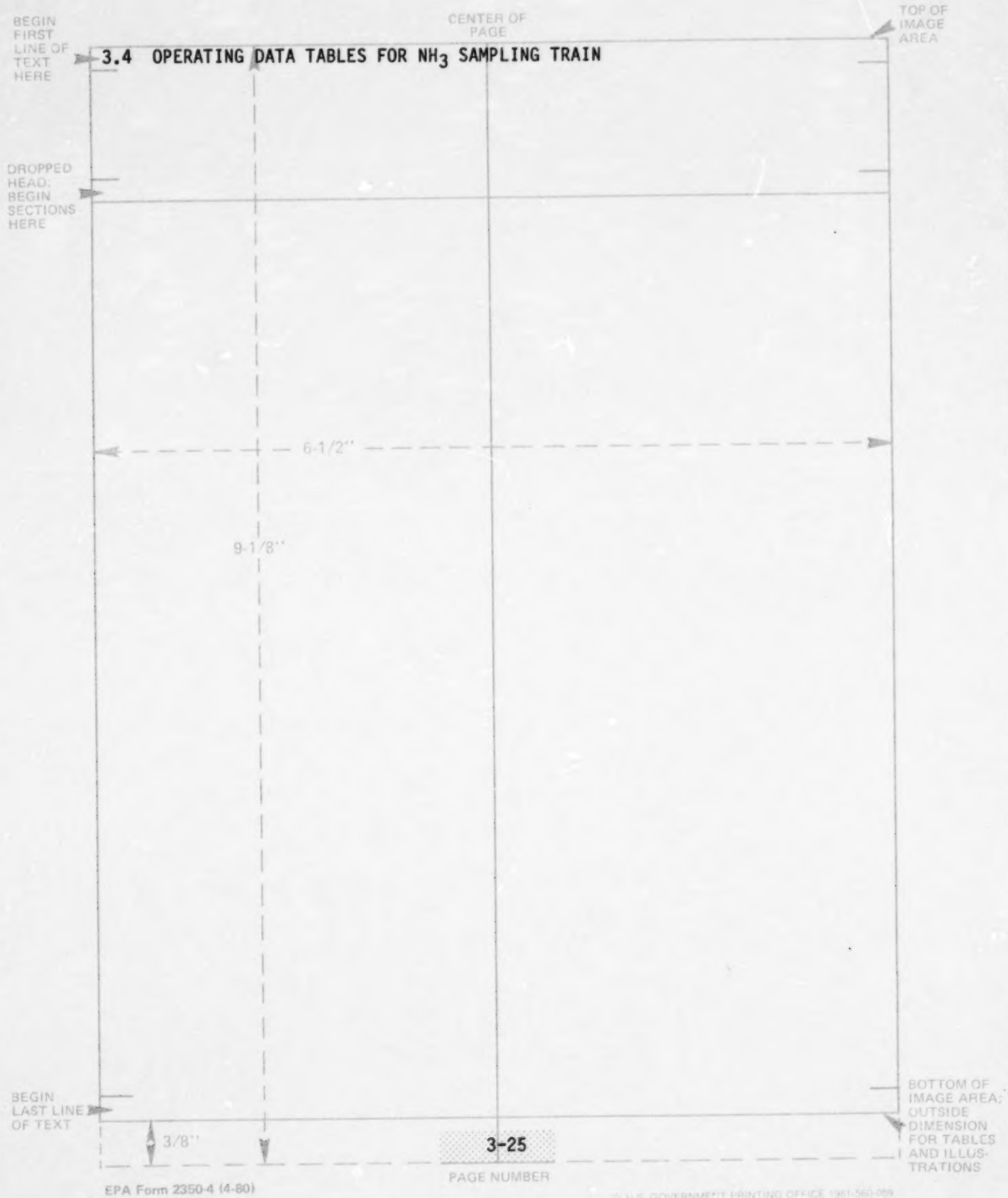

EPA Form 2350-4 (4-80)
(PREVIOUSLY CIN. EPA FORM 287)

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TYPING GUIDE SHEET

FIELD DATA

Plant SCG ALISO CANYON
Date AUG 3, 1984
Sample Location INLET - UNIT 6
Sample Type ~~CPC~~ NH_3
Run Number 1
Operator Barkus
Ambient Temperature 85
Barometric Pressure 28.52
Static Pressure, (H_2O) _____
Filter Number(s) _____

Leak Check: Initial at ~~[illegible]~~ Hg, .001 CFM
Final at 9 ~~[illegible]~~ Hg, .01 CFM
Pitot Leak Check: _____

Impinger Volumes

	Initial	Final	Net Gain
	100	112	12
	100	107	7
	0	2	2
Silica Gel	122.5	131.5	9.0
SASS Condensate			
Total Volume			30.0

Probe Length and Type _____
Nozzle Size & I.D. _____
Pitot Coefficient & I.D. _____
Assumed Moisture _____
Molecular Weight, Dry, (M_d) _____
Meter Box Number 0556
Meter Coefficient _____
a Factor _____
K = _____
$K(M_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(M_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Sampling Time, min / Clock Time (24-hr) Clock	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Actual	Temperature °F: Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1024	Init. 493.395												
~~1~~	5	496.145		0.~~75~~							81	82	8	
	10	498.635		.75							83	82	8	
	15	501.070		.75							82	82	8	
	20	503.490		.75							83	83	8	
	25	505.854		.75							84	84	8	
	30	508.160		.75							85	83	8	
	1054													
		14.765		0.75								83		

Comments:

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901593

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3-26
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FIELD DATA

Plant SCG ALISO CANYON
Date Aug 3, 1984
Sample Location INLET-1
Sample Type NH_3
Run Number A-INLET NH_3
Operator BARKUS
Ambient Temperature 85
Barometric Pressure 28.50
Static Pressure, (H_2O) _____
Filter Number(s) _____

Leak Check: Initial at 10 " Hg, .001 CFM
Final at 11 " Hg, .001 CFM
Pitot Leak Check: _____

Impinger Volumes	Initial	Final	Net Gain
	100	122	
	100	105	
	0	2	
Silica Gel	631.5	634.0	
SASS Condensate			
Total Volume			

Probe Length and Type _____
Nozzle Size & I.D. _____
Pitot Coefficient & I.D. _____
Assumed Moisture _____
Molecular Weight, Dry, (M_d) _____
Meter Box Number ~~0554~~ 0556
Meter Coefficient _____
a Factor _____
K = _____
$K(N_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Actual	Temperature °F: Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1456	Init. 508.583												
7	5	511.105		.75	.75						98	97	8	
	10	513.572		.75	.75						99	97	8	
	15	515.945		.75	.75						97	95	8	
	20	518.400		.75	.75						96	94	9	
	25	520.752		.75	.75						96	96	10	
	30	523.082		.75	.75						97	96	10	
		4.459			0.75						97			

Comments:

~~NH_3~~ -2IN

901595

Form 481 3/84

EPA Form 2350-4 (4-80) (PREVIOUSLY CIN. EPA FORM 247)
3/8"
3-27
PAGE NUMBER
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FIELD DATA

Plant SCG ALISO CANYON
Date Aug 3,1984
Sample Location OUTLET-1&2
Sample Type NH3
Run Number 1
Operator BARKLIS
Ambient Temperature 85
Barometric Pressure 28.50
Static Pressure, (H_2O)
Filter Number(s)

Leak Check: Initial at .01 " Hg, .12 CFM
Final at .02 " Hg, .12 CFM
Pitot Leak Check:

Impinger Volumes	Initial	Final	Net Gain
	100	116	16
	100	107	7
	0	2	2
Silica Gel	622.5	628.6	6.1
SASS Condensate			
Total Volume			31.1

Probe Length and Type
Nozzle Size & I.D.
Pitot Coefficient & I.D.
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number D554
Meter Coefficient
a Factor
K =
$K(N_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(N_d)^4 \left(\frac{Tm}{Ts}\right)$ (P)

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1022 / 0	Init. 350.377												
7	5	353.13		.75							84	88	11	
	10	355.78		.75							84	87	11	
	15	358.293		.75							88	89	11	
	20	360.775		.75							88	86	11	
	25	363.225		.75							92	94	11	
	30	365.784		.75							98	97	11	
	1052													
		15.537			.25						87			

Comments: Blank 1-2 NH_3 901633 901594

Form 461 3/84

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FIELD DATA

Plant SCG ALISO CANYON
Date AUG 3, 1984
Sample Location OUTLET - 6
Sample Type NH_3
Run Number 2 - OUTLET NH_3
Operator BARKUS
Ambient Temperature 86
Barometric Pressure 28.50
Static Pressure, (H_2O)
Filter Number(s)

Leak Check: Initial at 12 " Hg, .01 CFM
Final at 12 Hg, .055 CFM
Pitot Leak Check:

Impinger Volumes	Initial	Final	Net Gain
	100	118	18
	100	108	8
	0	2	2
Silica Gel	628.6	634.0	5.4
SASS Condensate			
Total Volume			33.4

Probe Length and Type
Nozzle Size & I.D.
Pitot Coefficient & I.D.
Assumed Moisture
Molecular Weight, Dry, (M_d)
Meter Box Number D554
Meter Coefficient
α Factor
K =
$K(M_d)^4$ = ___ x ( )^4 = ___
$\Delta H = K(M_d)^4 \left(\frac{Tm}{Ts}\right)^2 (P)$

Traverse Point Number	Clock Time (24-hr) Clock / Sampling Time, min	Gas Meter Reading (V_m), ft^3	Velocity Head (ΔP_s), in. H_2O	Orifice Pressure Differential (ΔH), in. H_2O Desired	Orifice Pressure Differential (ΔH), in. H_2O Actual	Temperature °F Stack	Probe	Impinger	Organic Module	Oven	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$
	1454 / 0	Init. 366.396												
1	5	366.900		.75	.75						95	92	10	
	10	371.435		.75	.75						95	92	10	
	15	373.935		.75	.75						97	94	10	
	20	376.350		.75	.75						99	96	10	
	25	378.940		.75	.75						100	97	16	
	30 / 1524	381.559		.75	.75						101	98	11	
		1563			.75						96			

Comments:

NO -2-OUT

901596

Form 461 3/84

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3.5 OPERATING DATA TABLE FOR VOST
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Volatile Organic Sampling Sampling Train (VOST) Data Sheet

Plant SCG - Aliso Canyon
Date 8-3-84
Sample Location Unit K-6 OUTLET STACK
Run No. 1
ALL SAMPLES TAKEN from ~~East~~ NORTH PORT

Project No. 307734.01
Operator M.M. MURRAY
Barometric Pressure (in. Hg) ~28.5
Ambient Temperature (°F) 100

Trap Set	Trap I.D.	Clock Time 24 Hour	Elapsed Time (minutes)	Dry Gas Meter (L)	Volume Sampled (L)	Temperature (°F) DGM	Probe	Heated Line	Tenax Inlet	Rotometer Setting	Pump Vacuum (in. Hg)	Leak Rate LPM at Vacuum	Comments
A	9	Start: 1225		0.00	22.344	80	250+	N/A	85/77	42	2	0.03LPM@	see note a
	10A	Stop: 1312		22.344		105	250	N/A	80/79	42	2	15" Hg	ΔH = 1.5
B	7	Start: /	/	/	/	/	/	/	/	/	/	/	Fuld Blank
	40A	Stop: /		/		/	/	/		/	/	/	
C	1	Start: 1341	40	0.000	19.745	109	250+	N/A	80/100	42	1.5	0.025LPM	ΔH = 1.90
	9A	Stop: N21		19.745		109	250+	N/A	79/88	43	2	@ 17" Hg	see note b
D		Start:											
		Stop:											
E		Start:											
		Stop:											
F		Start:											
		Stop:											
Summary													

Notes: a) Run A: Condensate trap broke during ice bath check - ran without a condensate trap.
b) Run C: Many charcoal drop had 2 numbers 9A + 35A

901626 901628 901630 901632

901627 901629 901631

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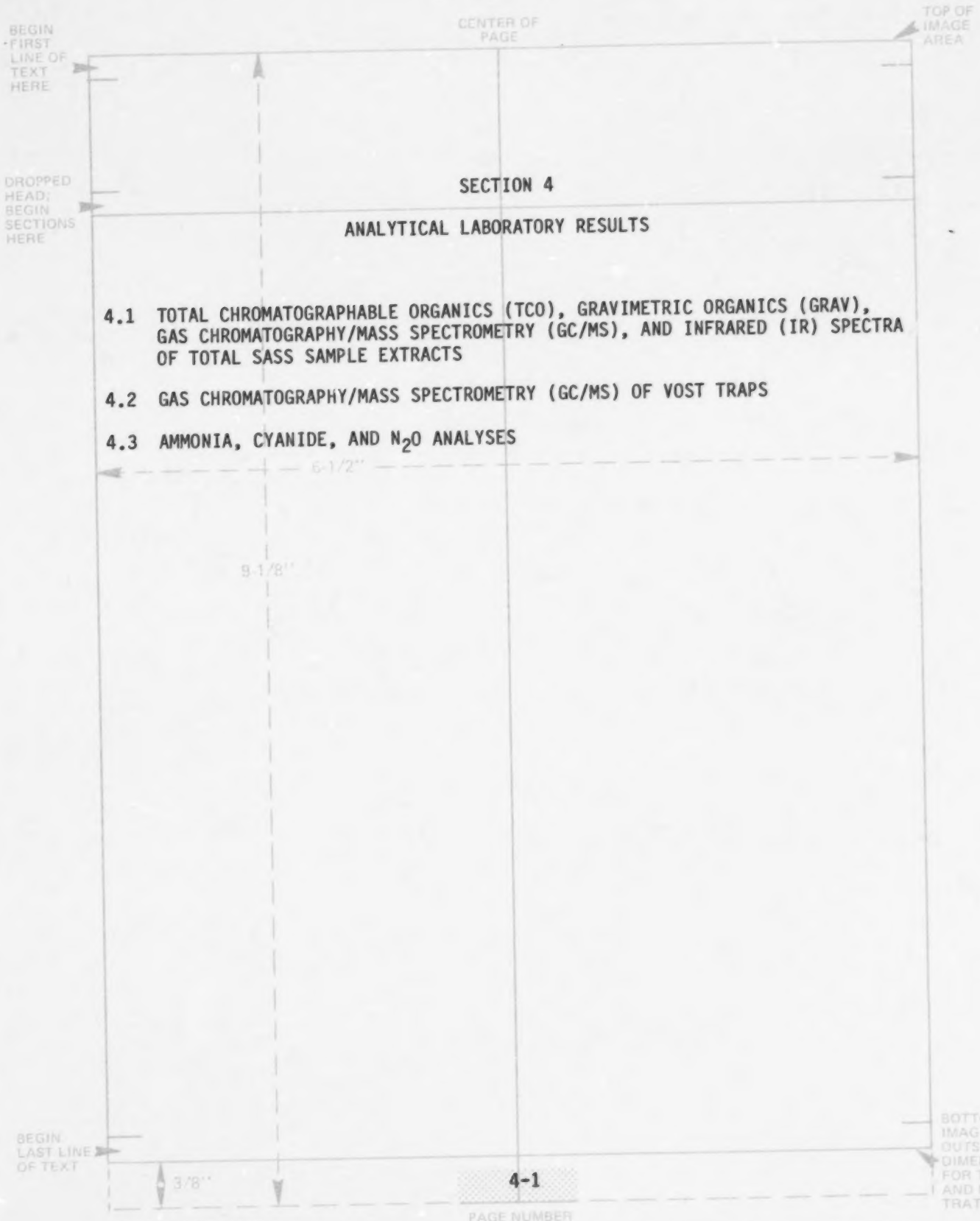

SECTION 4

ANALYTICAL LABORATORY RESULTS

4.1 TOTAL CHROMATOGRAPHABLE ORGANICS (TCO), GRAVIMETRIC ORGANICS (GRAV), GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS), AND INFRARED (IR) SPECTRA OF TOTAL SASS SAMPLE EXTRACTS

4.2 GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS) OF VOST TRAPS

4.3 AMMONIA, CYANIDE, AND N_2O ANALYSES

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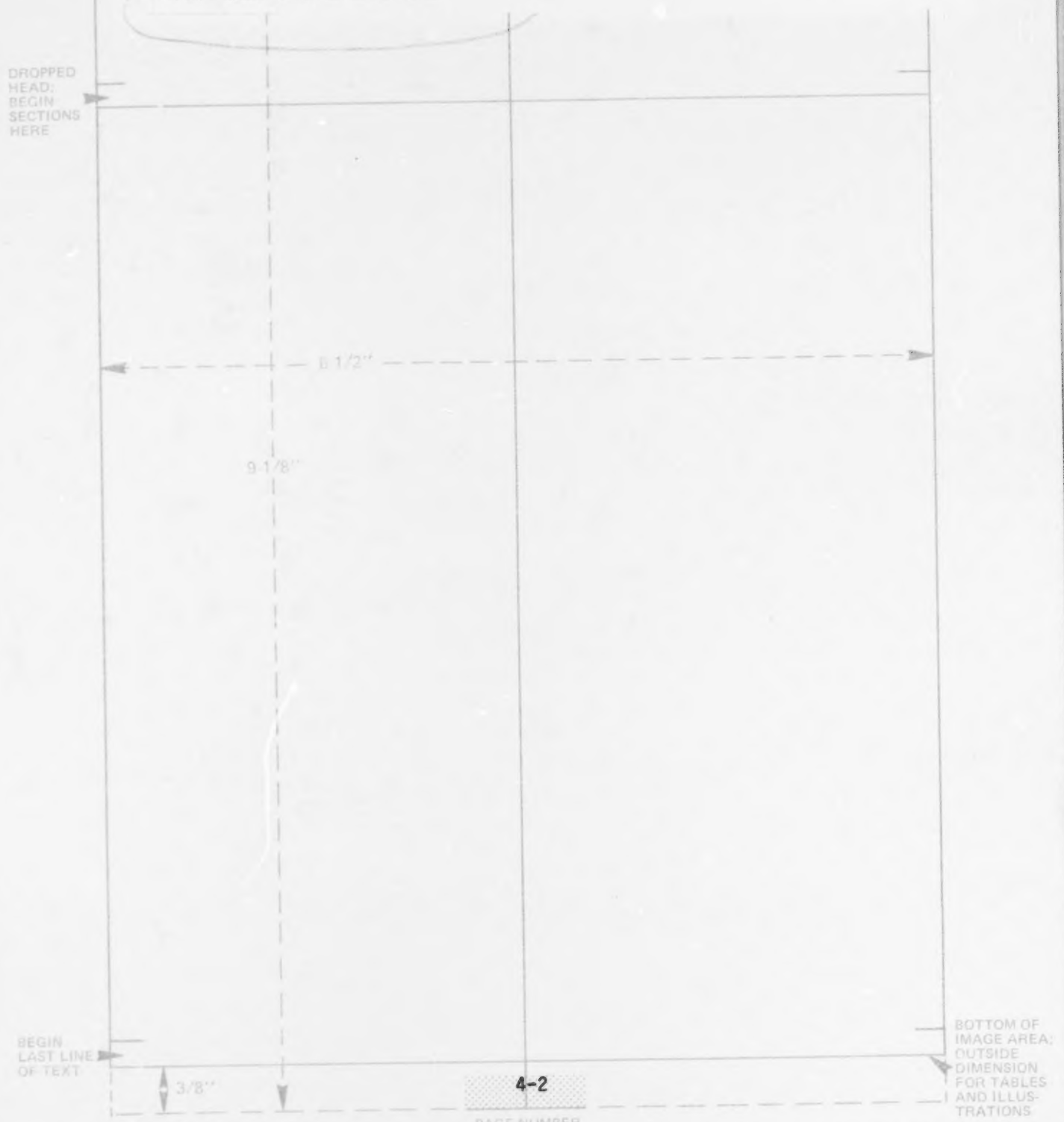
4.1 TOTAL CHROMATOGRAPHABLE ORGANICS (TCO), GRAVIMETRIC ORGANICS (GRAV), GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS), AND INFRARED (IR) SPECTRA OF TOTAL SASS SAMPLE EXTRACTS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ACUREX Corporation

Energy & Environmental Division

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Acurex/CEU
MS 2-2260

October 9, 1984
Acurex ID#: 8408-032
Client PO#: 307736.92

Attention: Larry Waterland

Sample: Aliso Canyon, 1 SASS Train;
Received 8/17/84

The above samples were analyzed by Level 1 protocol. The XAD and OMC extracts were combined per your instruction. Organic extracts were also analyzed for the semivolatile priority pollutants by gas chromatography/mass spectrometry employing a J&W SE-54 30 meter capillary column. The column was held at 30°C for 2 minutes, then ramped at 10°C per minute to 270°C. In addition to the priority pollutants, benzo(c)phenanthrene, dibenzo(c,g)carbazole, 7,12-dimethylbenzo(a)anthracene, 3-methylcholanthrene, and perylene were sought employing the computerized library search and manual interpretation. The assignment and quantitation of these organics is tentative since analytical standards of these compounds were not available for analysis. Benzo(c)phenanthrene, dibenzo(c,g)carbazole, 7-12-dimethylbenzo(a)anthracene, 3-methylcholanthrene and perylene were not detected in any of the samples at levels above 100 µg per train.

After extraction of the XAD field blank, the same resin was spiked with 400 µg each of dodecane, naphthalene, phenanthrene, and pyrene, 10 mg of bis(2-ethylhexyl)phthalate and 40 mg of hexadecane. The samples were then analyzed for TCO, GRAV, and PAH. Results are presented in Tables 1 through 3. Chromatograms and spectra are attached.

Submitted by:

Greg Nicell
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

Attachments

555 Clyde Avenue, P.O. Box 7555, Mountain View, CA 94039 (415) 964-3200 Telex: 34-6391 TWX: 910-7796593

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Table 1. TCO and GRAV Results

Sample	TCO		GRAV	
XAD-Inlet	44	mg/train	83	mg/train
XAD-Outlet	21, 24*	mg/train	16	mg/train
XAD-Blank	<0.1	mg/train	<2	mg/train
Separatory Extraction Blank	0.3	mg/train	<2	mg/train
XAD-Spike level	41	mg	51	mg
XAD-Spike recovery	71%		76%	

* Duplicate injection

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Table 2. GC/MS Results, µg/train

Analyte	XAD-Inlet	XAD-Outlet*	Spiked XAD, Recovery
Naphthalene	220	10, 10	78%
2-Nitrophenol	140	<10, <10	--
Di-n-butyl phthalate	80	160, 120	--
Bis(2-ethylhexyl)phthalate	50	30, 20	70%
Phenanthrene	10	<10, <10	85%
Pyrene	<10	<10, <10	62%
Other Priority Pollutant BNAs	<10	<10, <10	--

* Duplicate injection

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Table 3. Sample Disposition

Sample ID	Type	Initial	Subcontract	Organic	Remainder	
901643	XAD-Inlet	130 g	5 g	125 g	87%*	
901640	OMC-Inlet	1,822 mL	---	to XAD	2,040 mL	inorganic
901648	XAD-Outlet	130 g	5 g	125 g	87%*	
901645	OMC-Outlet	2,000 mL	---	to XAD	2,250 mL	inorganic
901646	XAD Blank	130 g	5 g	125 g	87%*	
------	XAD Spike	125 g	---	125 g	90%*	
------	Ext. Blank	1 L	---	1 L	90%*	

* As extract

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SAMPLE: 8408-032-1 XAD-Inlet

Wave Number (cm^{-1})	Intensity	Assignment	Comments
3350	W	OH Hydrogen bonding	Broad
2955	S	CH Aliphatic	
2920	S	CH Aliphatic	
2850	S	CH Aliphatic	
157	S	Not Assigned	
1460	S	CH	Tentative Assignment
1340	W	CH	Tentative
1260	M	CO	Tentative
1055	M	CO	Tentative
950	W	CH	
880	M	CH	
770	W	CH	
700	W	CH	
635	W	CH	
			Aliphatic

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SAMPLE: 8408-032-3 XAD-Outlet

Wave Number (cm^{-1})	Intensity	Assignment	Comments
2955	S	CH Aliphatic	
2920	S	CH Aliphatic	
2850	S	CH Aliphatic	
1710	S	C=O	
1450	M	CH	Tentative Assignment
1410	W	CH	Tentative
1255	S	CO	Tentative
800	M	CH	
			Aliphatic

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SAMPLE: 8408-032-5 XAD Blank

Wave Number (cm^{-1})	Intensity	Assignment	Comments
		No Peaks	

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SAMPLE: 8408-032-7 Separatory Funnel Extraction Blank

Wave Number (cm^{-1})	Intensity	Assignment	Comments
1260	S	CO	Tentative Assignment
1090	M	Not Assigned	
1025	M	Not Assigned	
800	S	CH	

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ACUREX Corporation

Energy & Environmental Division

Acurex/ES

October 1, 1984
Acurex ID#: 8408-008
Client PO#: 307736.92

Attention: Larry Waterland

Subject: GC/MS Analysis of Three Pairs of Tenax/Tenax Charcoal Traps; Received 8/6/84

The above referenced traps were analyzed for volatile priority pollutants according to the EPA VOST Protocol. Field blank traps were received with broken nut connectors. Results of our analysis are listed in Table 1.

If you have any questions, please call.

Prepared by: SMKraska
Susan M. Kraska
Staff Chemist

Approved by: Richard Scott
Richard Scott
Manager, GCMS Operations

SMK/VLA/ats

555 Clyde Avenue, P.O. Box 7555, Mountain View, CA 94039 (415) 964-3200 Telex: 34-6391 TWX: 910-7796593

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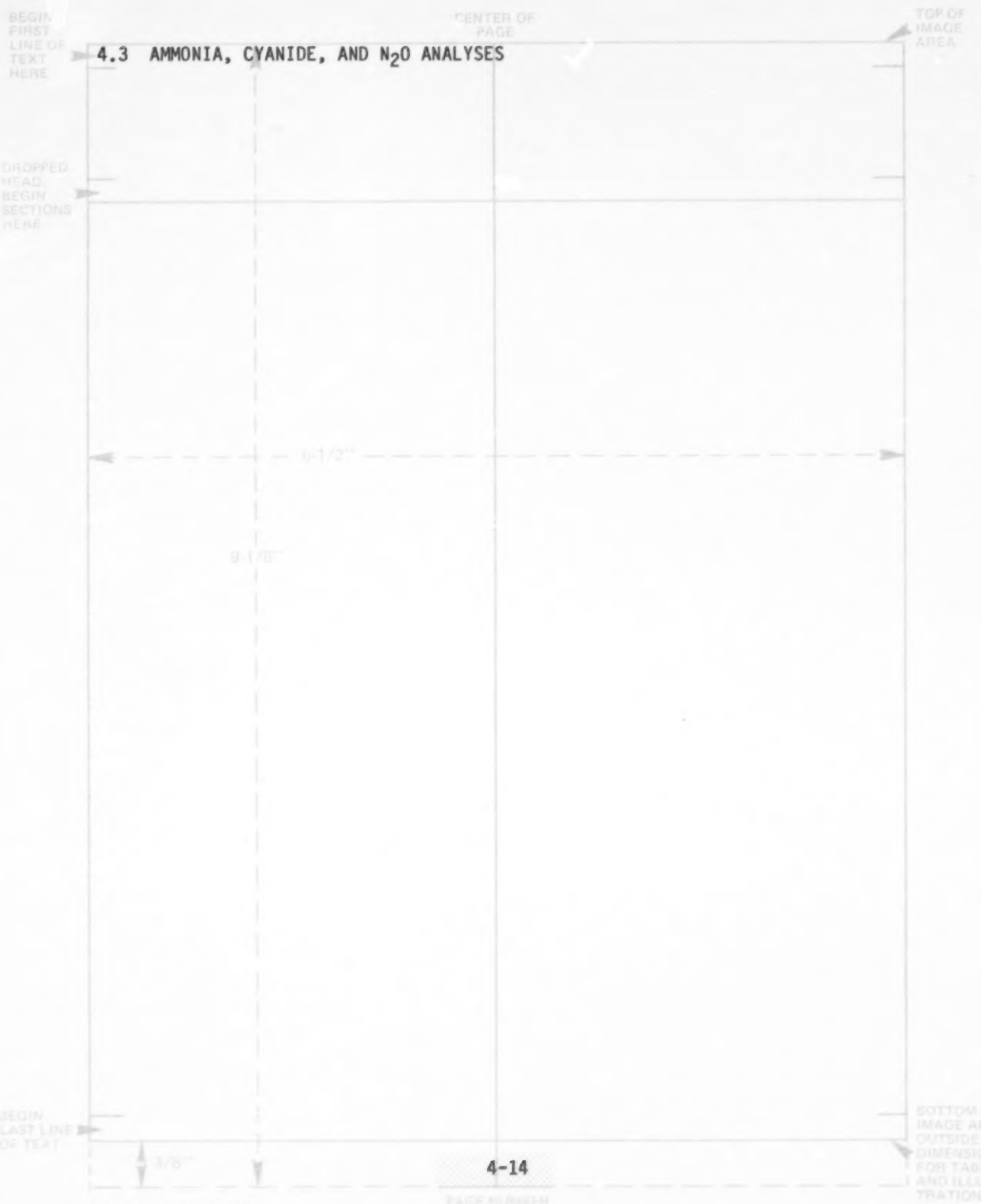
Table 1. Volatile Organics Results

Sample ID#	901626 901627	901628 901629	901630 901631	Blank Trap
Priority Pollutants	Concentration (ng/trap)			
Benzene	ND	ND	32,000	13
Chlorobenzene	1,700	ND	720	5
1.2-Dichloroethane	ND	ND	5	ND
1,1,1-Trichloroethane	ND	45	101	ND
1,1,2,2-Tetrachloroethane	60	ND	11	9
Chloroethane	56	ND	16	ND
Chloroform	11	ND	10	ND
1,1-Dichloroethene	31	ND	26	ND
Trans-1,2-Dichloroethene	7	ND	ND	ND
Ethylbenzene	700	ND	127	5
Methylene chloride	1,200	1,205	1,700	38
Chloromethane	155	111	130	58
Bromomethane	6	5	5	2
Tetrachloroethene	ND	ND	85	ND
Toluene	6,000	ND	3,700	31
Trichloroethene	ND	ND	3	ND
Vinyl chloride	11	ND	5	ND
All Other Priority Pollutants	ND	ND	ND	ND
Nonpriority Pollutants				
Acetone	720	5	ND	ND
Total Xylenes	ND	ND	3,000	10
Detection Limit	1	1	1	1
Surrogate Recoveries	Percent (%)			
Toluene-d_8	61	97	74	114

ND - Not Detected
Note: Field Blank Traps were received broken at nut connections.

4.3 AMMONIA, CYANIDE, AND N_2O ANALYSES



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ACUREX Corporation

Energy & Environmental Division

Acurex/ES (CMEA)

August 23, 1984
Acurex ID#: 8408-022
Client PO#: 307736.92
Page 1 of 1

Attention: Larrry Waterland

Subject: Chemical Analysis of 6 Hydrochloric Acid Impinger Solutions and 6 Sodium Hydroxide Impinger Solution, Received 8/9/84

The six sodium hydroxide impinger solutions were analyzed for cyanide content using EPA Method 335.2. Ammonia content for the hydrochloric acid impinger solutions was determined by ion selective electrode with EPA Method 350.3.

Results are presented below.

Sample			Ammonia Content, mg/L
901593	Inlet	Run 1	1,800
901594	Outlet	Run 1	150
901595	Inlet	Run 2	2,400
901596	Outlet	Run 2	78
901705	Outlet	Run 3	380
901633	Blank		<0.1

Sample			Cyanide Content, mg/l
901590	Inlet	Run 1	0.016
901598	Outlet	Run 1	4.0
901592	Inlet	Run 2	0.008
901597	Outlet	Run 2	4.1
901706	Outlet	Run 3	0.36
901634	Blank		<0.005

Prepared by: John S. Labash
John S. Labash
Chemist

Approved by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

JSL/GN/ats

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ACUREX Corporation

Energy & Environmental Division

Acurex/ES

September 27, 1984
Acurex ID#: 8408-039
Client PO#: 307736.92
Page 1 of 1

Attention: Larry Waterland

Subject: Analysis of 6 Gas Bombs for Nitrous Oxide by GC/ECD

The above referenced samples were analyzed by GC/ECD according to the previously reported method.

Results are listed in the table below:

Sample ID	N_2O (ppm)
901104	56
901105	52
901106	20
901107	65
901108	10
901109	220

If you have any questions, please call.

Prepared by: Greg Nicoll for
Richard Wood
Staff Chemist

Approved by: Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

RW/VLA/ats

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